金 木 水 火 土

FEATURE ARTICLE

The State of U.S.-China Relations on Climate Change: Examining the Bilateral and Multilateral Relationship

By Joanna Lewis

The state of the U.S.-China relationship on climate change has been changing rapidly in the wake of the Beijing presidential summit and the Copenhagen negotiations that took place in the final months of 2009. The bilateral talks on climate and energy issues between the two countries are critically important, not just for addressing climate change, but for the future of the U.S.-China relationship. Bilateral talks may also facilitate a multilateral agreement on climate change that involves both countries. Fundamental differences exist, however, between the United States and China in how they each view the bilateral relationship, and how they see their roles in the multilateral system; and these must be carefully navigated. There clearly can be no solution to global climate change without the United States and China, and such a solution will depend on the ability of these two countries to see eye to eye. It will take many years for them build the trust needed to overcome their differences on this issue, to develop and adopt low-carbon technologies, and to transform their economies. As the entire world looks to the United States and China to make a move, the fate of the global climate system remains in their hands.

China and the United States are the two largest national emitters of the greenhouse gases that contribute to global climate change, and together comprise almost half of global emissions. Any global solution to climate change must therefore include participation by these two countries.

Around the world, there has been much discussion in recent months about how to bring the United States and China into a multilateral climate change agreement, and increased attention has been placed on the evolving bilateral relationship between the two counties with respect to climate and energy cooperation. The year 2009 seems, on paper at least, to have been a very successful year for U.S.-China cooperation on clean energy and climate change. It began with the inauguration of President Barack Obama who prioritized addressing climate change in partnership with China, and the release of several calls for action for increased energy and climate cooperation between the United States and China by researchers and NGOs (Asia Society & Pew Center, 2009; Lieberthal & Sandalow, 2009; NRDC, 2009; U.S.-China Clean Energy Forum, 2009). Presidents Obama and Hu Jintao seemed to have answered the call by signing an impressively long list of bilateral agreements during their summit in Beijing in November (U.S. DOE, 2009a–i).

Bilateral talks on climate and energy issues between the United States and China are critically important, not just for addressing climate change but for the future of the U.S.-China relationship. They may also be crucial to facilitating a multilateral climate agreement that involves both countries. Fundamental differences exist, however, between the United States and China in how they each view the

U.S.-China bilateral relationship, and how they see their roles in the multilateral system; and these must be carefully navigated. This became plainly evident in the final months of 2009, when despite a successful summit between Presidents Obama and Hu in Beijing in November, U.S.-China climate change relations ended on a somewhat sour note in December at the close of the Copenhagen climate change negotiations.

This article examines the current state of the U.S.-China relationship on climate change in the wake of the Beijing summit and the Copenhagen negotiations. It begins by recapping each country's role in contributing to and addressing the climate challenge. To provide insights into the ever-evolving climate relationship the article then reviews achievements reached through bilateral agreements between the United States and China over the past two decades, and assesses future prospects for the program of cooperation. Examination of the chain of events in Copenhagen and their likely repercussions help illuminate how the United States and China found themselves at the epicenter of a complex political negotiation involving around 190-plus countries. Finally, the article offers some ideas about how the United States and China could best use bilateral and multilateral forums to more effectively promote future bilateral climate change cooperation in a way that could be agreeable to both countries, while ensuring the rest of the world benefits from such cooperation.

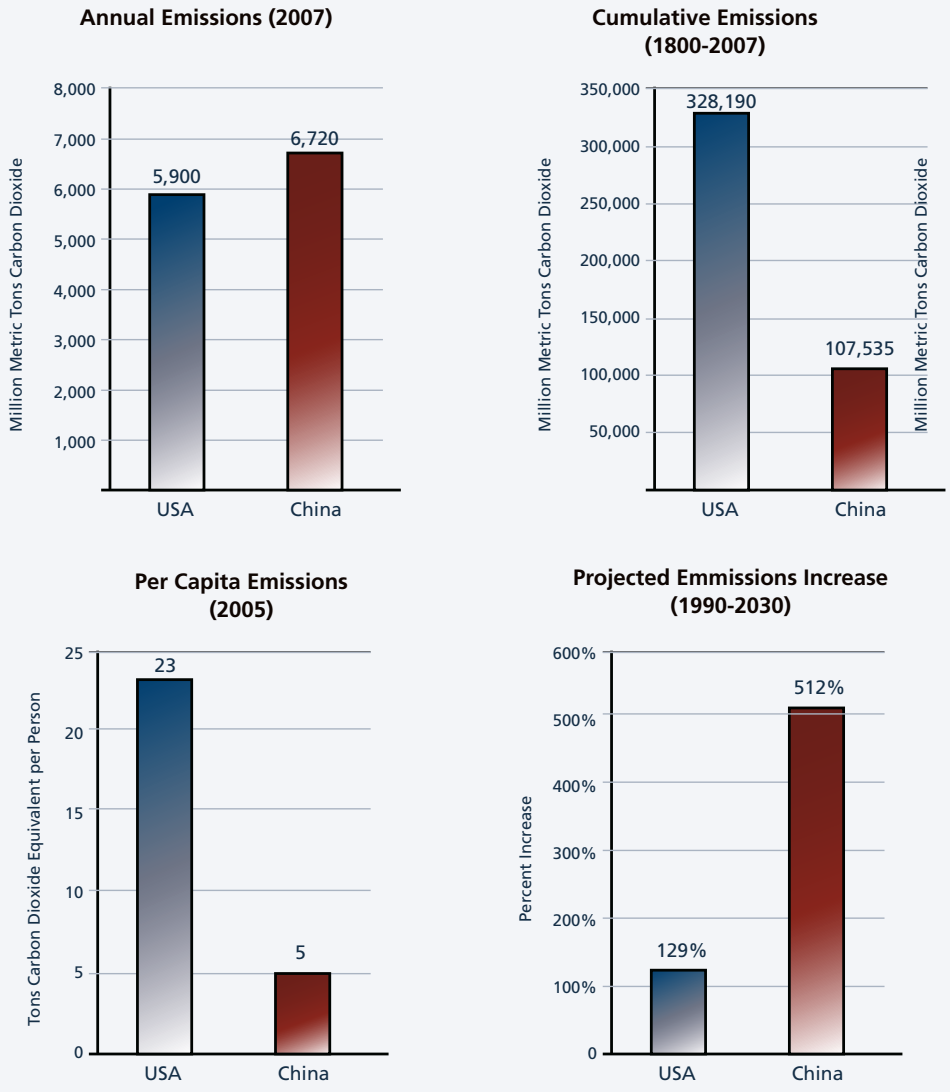
THE ROLE OF THE UNITED STATES AND CHINA IN CLIMATE CHANGE

Greenhouse Gas Emissions

In historic terms, the United States is by far the largest contributor to the greenhouse gases now burdening the atmosphere, responsible for 29 percent of energy-related CO_2 emissions since 1850. China accounts for only about eight percent of these historic emissions. As China's economy has boomed, its emissions have soared, and it is now the world's largest emitter of greenhouse gases annually. Looking ahead, most projections put China's emissions in 2030 in the range of 500 percent above 1990 levels (EIA, 2009). Globally, this translates to about 40 percent of all new energy-related CO_2 emissions between now and 2030. If China's emissions continue to grow at the rate of 10 percent per year, by the year 2040, it could be emitting as much CO_2 as the entire world is today. In contrast, U.S. emissions are expected to grow in the rage of 130 percent between 1990 and 2030 (EIA, 2009).

If China's emissions continue to grow at the rate of 10 percent per year, by the year 2040, it could be emitting as much CO_2 as the entire world is today.

Figure 1. Carbon Dioxide Emmissions Metrics in the United States and China



Reliance on Coal

Both China and the United States are heavily reliant on coal to fuel their energy systems, and are the world's largest and second largest producers and consumers of coal in the world, respectively. In the United States, which has the world's largest coal reserves, coal fuels 22 percent of primary energy and 49 percent of electricity generation. In China, coal fuels about 69 percent of primary energy, and 80 percent of electricity generation.

Given the substantial domestic coal reserves in each country and their heavy investment in coal-fired power plants over the past few decades, coal will likely remain an inescapable foundation of their economies for years to come. To render coal a climate-friendly energy source, however, will require significant advances and sustained investment in new technologies to burn it more efficiently as well as to capture and sequester the resulting greenhouse gas emissions.

In China, the average efficiency of coal power plants is rapidly catching up to that of developed countries as new, larger units come online and smaller, less efficient units are shut down. It is estimated that the average efficiency of China's coal-fired fleet was 32 percent in 2005, but is expected to approach 40 percent by 2030 as more large supercritical units come online and older subcritical units are phased out. In the United States, the majority of existing coal plants was built before 1989 using subcritical pulverized coal technology.

Accomplishments to Date

China's Low-Carbon Development Programs

Both the United States and China have begun to implement national policies and programs to address their increasing greenhouse gas emissions and reliance on fossil fuels. In China, the government has adopted a National Climate Change Program outlining an array of programs and policies to address climate change in the areas of energy efficiency, renewable energy, nuclear power, land use and forestry, and technology development. Domestic policies that could achieve significant greenhouse gas reductions include a national target to reduce energy intensity by 20 percent from 2005 levels by 2010, and a target for 15 percent of primary energy from non-fossil sources by 2020. In order to promote aggressive implementation of this challenging target and improve local accountability, China's National Development and Reform Commission (NDRC) has allocated the target among provinces and industrial sectors, and energy efficiency improvement is now among the criteria used to evaluate the job performance of local officials. There have also been increases in staffing and funding in key government agencies that monitor energy statistics and implement energy efficiency programs. In 2008 alone, China reportedly allocated 14.8 billion Yuan ($2.2 billion) of treasury bonds and central budget, as well as $27 billion Yuan ($3.9 billion) of governmental fiscal support to energy saving projects and emission cuts ("China's energy consumption," 2008).

To better facilitate local-level implementation, additional programs have been established to encourage specific actors to help meet this national intensity goal, including a program established in 2006 to improve energy efficiency in China's 1,000 largest enterprises (Price & Wang, 2007), which together consume one-third of China's primary energy. Another government effort targets the elimination, by 2010, of a number of small, inefficient power plants that represent around 8 percent of China's total generating capacity, by the end of 2010. Similar plant closings are planned across the industrial sector for inefficient cement, aluminum, ferro-alloy, coking, calcium carbide and steel plants.

Impact on China's Energy Intensity

As a result of the implementation of the measures described above to help the country mobilize towards achieving the 20 percent energy intensity reduction goal, China's worrisome trend of increasing energy intensity between 2003 and 2005—after decades of decreasing intensity—was successfully reversed starting in 2006. In order to meet the goal by 2010, China needed to achieve an average decline of 4 percent per year. In 2006, energy intensity was down 1.79 percent from the previous year; in 2007 it was down 4.04 percent; and in 2008 by 5.2 percent.[1] At the close of 2009, the government reported that energy intensity was down 14.38 percent from 2005 levels (Chen, 2010). Still short of the reductions needed to reach the 20 percent goal, several additional measures were put in place in a final effort to meet the target by the end of this year (Seligsohn, 2010). Due to reinvigorated economic growth in the first part of 2010, however, achieving the target is beginning to look less and less likely (Hornby, 2010).

The Carbon Challenge Remains

While estimates have been made of the

potential carbon emissions savings that could accompany the 20 percent energy intensity reduction target (Lin et al., 2007), China never put forth any targets that explicitly quantified its carbon emissions until late 2009. In November of that year the Chinese leadership announced its intention to implement a domestic carbon intensity target of a 40 to 45 percent reduction below 2005 levels by 2020 (PRC, 2009b). This target came within hours of President Obama's announcement that the United States would reduce its carbon emissions "in the range of 17%" from 2005 levels by 2020, and that the President himself would attend the UN international climate change negotiations in Copenhagen (White House, 2009b).

Between 1990 and 2005, China reduced its carbon intensity by 44 percent.

There is no question that China's announcement of its first carbon target represents a monumental change in China's approach to global climate change. It is also important to recognize, however, that even with this target in place, growth in absolute emissions could continue to increase rapidly. A meaningful reduction of emissions by a carbon intensity target that is a ratio of carbon emissions and GDP hinges upon future economic growth rates and the evolving structure of the Chinese economy, as well as on the types of energy resources utilized and the deployment rates of various technologies, among other factors. Carbon intensity, like energy intensity, has declined substantially over the past two decades. Between 1990 and 2005, China reduced its carbon intensity by 44 percent. China is also projected to reduce its carbon intensity 46 percent from 2005 levels by 2020, while still growing its emissions by 73 percent during this same period (EIA, 2009). This has sparked much debate over whether this domestic policy target is sufficient based on China's role in the global climate challenge.

Stalled U.S. Action on Greenhouse Gas Emissions

The United States has yet to enact a mandatory federal program to regulate greenhouse emissions on an economy-wide basis, though the House of Representatives has passed a bill proposing such a program, and a Senate bill is currently under discussion. As a result, the targets that President Obama put forth in Copenhagen may end up varying "in line with congressional legislation;" or if congress fails to act, and the Environmental Protection Agency is not able to pass carbon regulations of its own, the targets may never actually be enacted. In the meantime, however, in the absence of a federal mandate, 23 states are now participating in regional initiatives to reduce emissions through cap-and-trade systems. The State of California has set a mandatory goal of reducing emissions to 1990 levels by 2020, and 80 percent below 1990 levels by 2050. In addition, 36 U.S. states currently have renewable portfolio standards or specific goals to increase the use of renewable energy.

THE U.S.-CHINA BILATERAL RELATIONSHIP

The Opportunity

The United States and China not only share the top position of greenhouse gas emitters for developed and developing countries respectively, they also share many challenges in reducing their emissions. As large global economies, maintaining strong economic growth is a fundamental goal for political leaders hoping to maintain popularity. Both countries have abundant domestic coal resources that provide energy security benefits. While both China and the United States have excellent renewable resources, including wind and solar, the best resources and locations for renewable power plant development tend to be located far from population centers and electricity demand, and thus will require expanded and modernized

transmissions infrastructures. Both countries have realized the potential energy efficiency gains that they can achieve, but they lag Europe, Japan and others in developing a more efficient energy system (Asia Society & Pew Center, 2009).

Due to the similarities in energy systems shared by the two countries, there are many areas where both the United States and China could benefit from cooperation on climate change and clean energy development. The United States and China in fact have a long history of bilateral energy and environmental cooperation both through official governmental channels, as well as between universities and nongovernmental organizations. Some examples of this historical and ongoing cooperation are described below, with a more comprehensive list of official bilateral cooperation on energy and climate change provided in Table 1.

Official Bilateral Energy Cooperation

Foundational Agreements

In 1979, the MOU for Bilateral Energy Agreements was signed between the U.S. Department of Energy (DOE) and the China State Development Planning Commission (SDPC), which over time led to 19 cooperative agreements on energy, including on renewable energy. Almost two decades later, in 1995, a series of bilateral agreements between the United States and China were signed by Secretary of Energy Hazel O'Leary including an agreement between the DOE and the Chinese Ministry of Agriculture on renewable energy, and between DOE and the State Science and Technology Commission (SSTC) on renewable energy technology development.

In 1995, the *Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization* was signed between the DOE and various Chinese ministries. In 1997, President Jiang Zemin visited the United States, and the joint Energy and Environment Cooperation Initiative was signed between the DOE and the China State Planning Commission (SPC). The initiative targeted urban air quality, rural electrification and energy sources, and clean energy sources and energy efficiency. This ambitious initiative notably involved multiple agencies, as well as participants from business sectors, and linked energy development and environmental protection.

High-Level Forums for Dialogue

Also in 1997, Vice President Al Gore and then-Premier Li Peng co-chaired the first session of the U.S.-China Forum on Environment and Development in Beijing. The purpose of the forum was to expand cooperation and intensify dialogue between the United States and China on issues related to sustainable development, particularly protection of the global environment. During President Jiang's 1997 visit, Secretary of Energy Federico Peña and State Planning Commission Vice Chairman Zeng Peiyan signed the Energy and Environment Cooperation Initiative, an outgrowth of the forum designed to focus cooperative efforts on the intersection of energy and environmental science, technology, and trade. The second meeting of the forum was held in April 1999 in Washington, and was co-chaired by Vice President Gore and Premier Zhu Rongji (White House, 1999).

In 2006 the U.S.-China Strategic Economic Dialogue (SED) was founded by Vice Premier Wu Yi and U.S. Treasury Secretary Henry Paulson. The dialogue includes several agencies, including the DOE, U.S. Environmental Protection Agency (EPA), the NDRC, and China's Ministry of Science and Technology (MOST). It is a bi-annual, cabinet-level dialogue that includes an energy and environment track. In April 2009 the dialogue was re-branded as the U.S.-China Strategic and Economic Dialogue (S&ED), with the U.S. State Department and Treasury Department now co-chairing the dialogue for the United States. The strategic

component was transferred to the State Department, and includes discussions on energy and climate change cooperation between the two countries. During the first meeting in July 2009, Treasury Secretary Timothy F. Geithner and Secretary of State Hillary Rodham Clinton were joined for the dialogue by their respective Chinese co-chairs, State Councilor Dai Bingguo (for the strategic track) and Vice Premier Wang Qishan (for the economic track) (Treasury, 2009). The second meeting was held in Beijing in May 2010 and included both high-level dialogues and public-private forums (discussed below). The Strategic Track produced 26 specific outcomes on energy security and climate change, including a Joint Statement on Energy Security Cooperation (State, 2010).

In 2008 the U.S.-China Ten-Year Framework for Cooperation on Energy and Environment (TYF) was signed as part of the fourth SED. On the U.S. side, the TYF includes DOE, Treasury, State, Commerce, and EPA; on the Chinese side it includes NDRC, the State Forestry Administration, the National Energy Administration (NEA), the Ministry of Finance, the Ministry of Environmental Protection (MEP), the Ministry of Science and Technology (MOST), and the Ministry of Foreign Affairs (MFA). It initially established five joint task forces on the five functional areas of the framework: (1) clean, efficient and secure electricity production and transmission; (2) clean water; (3) clean air; (4) clean and efficient transportation; and (5) conservation of forest and wetland ecosystems (Treasury, 2008). These five areas were further elaborated in seven specific action plans for implementation (State, 2008), and later expanded upon in the July 2009 *Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and Environment,* initialed by U.S. Secretary of State Hillary Rodham Clinton, U.S. Secretary of Energy Steven Chu, and Chinese State Counselor Dai Bingguo (State, 2009). The most recent Joint Working Group Meeting for the TYF was held in Washington, D.C. in May 2010.

New Push for Bilateral Energy Cooperation

In July 2009 came the Obama administration's first announcement on U.S.-China energy cooperation in conjunction with Secretary Steven Chu's first trip to China (DOE, 2009a). Chinese Minister of Science and Technology Wan Gang and Chinese National Energy Administrator Zhang Guobao, along with Chu, signed a protocol announcing plans to develop a U.S.-China Clean Energy Research Center (CERC) that would facilitate joint research and development on clean energy by teams of scientists and engineers from the United States and China, as well as serve as a clearinghouse to help researchers in each country. The center would have one headquarters in each country, at locations to be determined, with priority topics to include building energy efficiency; clean coal (including carbon capture and storage); and clean vehicles. At the July meeting, the United States and China together pledged $15 million to support initial activities, with each government pledging equal amounts.

The U.S.-China Presidential Summit in Beijing in November 2009 resulted in a significant set of new agreements on joint energy and climate cooperation between the two countries (DOE, 2009b). First, the details surrounding the aforementioned U.S.-China Clean Energy Research Center (CERC) were formally announced, including the fact that the center will be supported by public and private funding of at least $150 million over five years, split evenly between the two countries (DOE, 2009c). As elaborated in the Protocol between the U.S. Department of Energy and the Ministry of Science and Technology and the National Energy Administration (NEA) of China for Cooperation on a Clean Energy Research Center, each side is to fund only the research activities of scientists from their own country. Any intellectual property rights created through CERC cooperative activities are to be jointly

owned by both parties involved, with respective contributions pre-agreed by both sides under Technology Management Plans for each project. In addition the U.S. DOE and MOST/NEA are to jointly establish the U.S. China Steering Committee on Clean Energy Science and Technology Cooperation to provide high-level guidance for research activities and Secretariats based in each country to coordinate the joint activities (DOE, 2009j). In March 2010, U.S. Energy Secretary Steven Chu announced the availability of $37.5 million in U.S. funding over the next five years to support the CERC, which will require matching funding from the grantees for a total of $75 million; the center will include an additional $75 million in Chinese funding (DOE, 2010).

Second, in November 2009 the Presidents announced the launch of the U.S.-China Electric Vehicles Initiative (DOE, 2009d). The electric vehicles initiative will include joint standards development, demonstration projects in more than a dozen cities, technical roadmapping and public education projects, and builds upon the U.S.-China Electric Vehicle Forum held in Beijing in September 2009 (DOE, 2009d, and 2009e). Third, the Presidents announced a new U.S.-China Energy Efficiency Action Plan targeting buildings, industrial and residential sectors through the development of energy efficient building codes and rating systems, the energy efficiency benchmarking of industrial facilities, the training of building inspectors and energy efficiency auditors for industrial facilities, the harmonizing of test procedures and performance metrics for energy efficient consumer products, the exchange of best practices in energy efficient labeling systems, and the convening of a new U.S.-China Energy Efficiency Forum to be held annually, rotating between the two countries (DOE, 2009f). The Presidential summit also produced the

HIGHLIGHTS OF US-CHINA ENERGY AND CLIMATE CHANGE COOPERATION (1979-2010)

(SEE FULL TIMELINE WITH EXPLANATIONS IN TABLE 1 ON PAGE 26)

1979
Scientific and Technology Cooperative Agreement

1979
MOU for 19 Bilateral Energy Agreements

1979
Atmosphere and Science and Technology Protocol

1985
Fossil Energy Protocol (Renewed in 2000 and 2005)

1994
Annexes to the Fossil Energy Protocol

1995
Series of DOE Bilateral Agreements

1995
Energy Efficiency and Renewable Energy Protocol

1980 · 1990 · 2000

1992
U.S. Joint Commission on Commerce and Trade (Includes Environment Subgroup)

1993
Establishment of the Beijing Energy Efficiency Center (China's first energy NGO)

1995

1997
1st Meeting of U.S.-China Forum on Environment & Development

1999
2nd Meeting of U.S.-China Forum on Environment & Development

2000
U.S.-China Energy Policy Dialogue

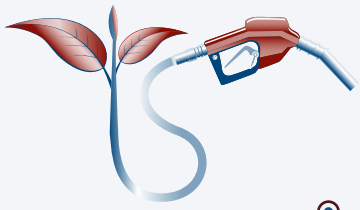
Sources: Asia Society & Pew Center, 2009; Price, 2008; Baldinger & Turner, 2002; DOE, 2006, 2008, 2009a, 2009b, 2009c, 2009d, 2009e, 2009f, 2009g, 2009h, 2009i, 2009j, 2010; State 2008, 2009, State, 2010; USTR, 2009; Treasury, 2008, 2009; White House Press Office, 1999, 2009a, 2009b.

announcement of a new U.S.-China Renewable Energy Partnership (USCREP). According to the U.S. Department of Energy, "both Presidents embraced a vision of wide-scale deployment of renewable energy including wind, solar and advanced bio-fuels, with a modern electric grid, and agreed to work together to make that vision possible (DOE, 2009g)." The National Renewable Energy Laboratory (NREL) is leading U.S. efforts on the USCREP.

Other agreements announced at the November 2009 Presidential Summit included the "21st Century Coal" pledge to promote cooperation on cleaner uses of coal, including large-scale carbon capture and storage (CCS) demonstration projects (DOE, 2009h); the Shale Gas Resource Initiative (DOE, 2009i); and the U.S.-China Energy Cooperation Program (ECP) to leverage private sector resources for project development work in China across a broad array of clean energy projects. The ECP program includes more than 22 companies as founding members, encompassing collaborative projects on renewable energy, smart grid, clean transportation, green building, clean coal, combined heat and power, and energy efficiency.

During the May 2010 meeting of the S&ED in Beijing, three clean energy forums established by the above agreements were held, including the U.S.-China Renewable Energy Industry Forum, the U.S.-China Advanced Biofuel Forum, and the U.S.-China Energy Efficiency Forum. All forums included representatives from both government and industry, and were accompanied by the announcements of many new public and private sector partnerships.

At the Biofuels Forum, 8 MOUs were signed covering topics such as aviation biofuel and cellulosic ethanol (Wang, 2010). Many private sector partnerships were also announced, including a partnership between Boeing and



2005

January 2006
Launch of Asia-Pacific Partnership on Clean Development and Climate

December 2007
USDA and NDRC Sign MOU on Biofuels

December 2007
U.S.-China Westinghouse Nuclear Reactor Agreement

December 2008
Ten Year Energy & Environment Cooperation Framework

November 2009
Presidential Summit Produced 9 New Bilateral Energy Agreements

November 2009
U.S.-China Energy Cooperation Program—Public-Private Partnership with 22 companies

2010

December 2006
First Meeting of the U.S.-China Strategic Economic Dialogue (Includes energy and environment track)

April 2009
U.S.-China Strategic & Economic Dialogue

July 2009
U.S.-China Clean Energy Research Center

MAY 2010
U.S.-China Strategic & Economic Dialogue—MOUs on Shale Gas, Ecopartnerships, Energy Forums

MAY 2010
Trio of U.S.-China Forums: Energy Efficiency/Renewable Energy/Advanced Biofuels

PetroChina to work together to evaluate developing a sustainable aviation biofuels industry in China; an expanded research collaboration between Boeing Research & Technology and the Chinese Academy of Science's Qingdao Institute of Bioenergy and Bioprocess Technology on algae-based aviation biofuel development; and an inaugural flight using sustainable biofuel derived from biomass grown and processed in China conducted by Air China, PetroChina, Boeing and Honeywell ("Boeing and Chinese Energy Officials," 2010). At the Renewable Energy Forum, Applied Materials and China Energy Conservation and Environmental Protection Group (CECEP) signed a MOU to explore projects to accelerate the development and deployment of solar energy including through a 5 MW thin film PV project in Inner Mongolia ("Applied Materials," 2010).

Nongovernmental Cooperation

In addition to official government cooperation, there are many forms of U.S.-China energy cooperation between academic institutions, nongovernmental organizations, foundations, and the private sector, which have often been more sustained than the formal bilateral collaboration. Examples of these nongovernmental cooperation programs are briefly described below.

Similar to the government-established ECP, there are several nongovernmental partnerships focused specifically on engaging the private sector in both countries to establish partnerships, such as the American Council on Renewable Energy's U.S.-China Program, The Clean Air Task Force's Asia Clean Energy project, the Joint U.S.-China Collaboration on Clean Energy (JUCCCE), and the U.S.-China Green Tech Summit. Other organizations have convened groups of stakeholders to provide high-level recommendations to the U.S. and Chinese governments on U.S.-China energy and climate cooperation, such as the Asia Society's Initiative for U.S.-China Cooperation on Energy and Climate, and the U.S.-China Clean Energy Forum. Track II U.S.-China dialogues comprised of leading thinkers outside the government or former government officials, such as those convened by the Brookings Institution and the Carnegie Endowment for International Peace, provide opportunities for high-level exchanges on climate and energy in a non-official environment. In addition, many U.S.-based nongovernmental environmental organizations now have sizable offices in China and engage in cooperative activities with Chinese partners, including Natural Resources Defense Council and Environmental Defense Fund, and World Resources Institute. Many U.S. and Chinese universities have official research collaborations on energy and climate issues, for example the Tsinghua-MIT Low Carbon Energy Research Center.

One of the largest nongovernmental organizations engaged in U.S.-China co-operation is the China Sustainable Energy Program (CESP), established by the San Francisco-based Energy Foundation in Beijing in 1999. Staffed by Chinese nationals and supported by international experts, CESP supports China's energy efficiency and renewable energy policy efforts. Armed with an astute political sense and excellent relationships with government leaders, as well as a multi-million dollar budget, the CSEP serves as a grant-maker for Chinese agencies, experts, and entrepreneurs so they can solve energy challenges for themselves, and links them with "best practices" expertise from around the world (CESP, 2009).

BARRIERS TO COOPERATION

Looking at the list of past and ongoing clean energy cooperation efforts between the governmental, nongovernmental and private sector in China, it is clear that there has been quite a bit of activity. While the official governmental track is certainly not the only means of bilateral cooperation, nor is it always the most effective, it is clearly important for

cooperation to occur through official as well as unofficial channels. Despite the long list of official bilateral agreements signed between the United States and China in the area of clean energy and climate change, there have been many challenges to following through on the successful implementation of agreed upon activities. Official bilateral cooperation has suffered in the past from a lack of consistent funding as well as from insufficient high-level political support and commitment. Cooperation is also hampered by the increasingly competitive relationship between the United State and China in the global economic marketplace.

Funding and Follow Through

While the list of agreements signed has been well documented by both governments, less attention has been paid to the results of these programs. The level of funding support provided to each initiative is generally also quite difficult to track, in many cases because the MOUs or initiatives signed were not backed by secure funding commitments. As a result, there has been some skepticism surrounding government agreements for bilateral cooperation that are not accompanied by both high-level political support *and* dedicated funding commitments. This skepticism has played a role in U.S.-China bilateral relations, and has contributed to some mistrust, or at the very least to reluctance to pursue future cooperation initiatives.

The cancellation or downscaling by the United States of several key clean energy projects has led to an understandable skepticism in China on the prospects for stronger long-term cooperation. Recent examples include the two-plus year expiration and eventual renewal of the U.S.-China Protocol on Energy Efficiency and Renewable Energy, and the postponement and significant restructuring of the FutureGen project to build, in partnership with China, a commercial-scale advanced generation coal plant with carbon capture and storage.[2]

It is particularly notable that more U.S.-China bilateral clean energy and climate change agreements were signed in the year 2009 than in any prior year. The fact that the majority of these agreements were signed by the President of each country illustrates political support at the highest level on both sides. Many of the details regarding the implementation of these agreements are yet to be worked out, but real challenges remain, particularly regarding stable funding resources. The agreements outlining the new China-U.S. Clean Energy Center and the Renewable Energy Partnership, for example, both point to existing funding sources for implementing domestic actions in both countries, with minimal additional funding sources for collaborative projects. While it is clearly important that both sides bring some form of resources to the table, if nothing new is allocated for these agreements, it is unclear how they will result in any deviation from current practices. In addition, if both sides are paying their own way and there is no financial incentive for cooperation, activities must be in the clear interest of both sides or there is little reason for either to come to the table.

Cooperative Competitors?

Cooperation is increasingly common between the United States and China in areas ranging from basic research to joint business ventures. At the same time, China and the United States are competitors for resources, talent, and economic markets. While competition can be an engine for innovation, and clean energy development in particular is an area where innovation will be vital, it is hard for any country to put long-term global interests ahead of near-term domestic interests—particularly in the fast-moving clean technology sector.

Fears that U.S. climate regulations would help Chinese companies out-compete American companies have led to the inclusion of trade measures aimed at large developing countries—primarily China—in several draft proposals for climate change legislation in the United States Congress ("Trade Sanctions Emerge," 2007). The inclusion of trade measures became

prevalent in several legislative proposals of the 110th Congress (2007-2008) including S.1766, the "Low Carbon Economy Act" introduced by Senators Jeff Bingaman and Arlen Specter, and S. 2191, "America's Climate Security Act," introduced by Senators Joseph Lieberman and John Warner; in the current Congress (111th), similar provisions are contained in the American Power Act introduced by senators Kerry and Lieberman. With a stated purpose of protecting against foreign countries' undermining a U.S. objective of reducing greenhouse gas emissions, U.S. importers must buy international reserve allowances to offset lower energy costs of manufacturing certain goods coming from certain countries.[3] While some least developed countries are excluded from these requirements, most developing countries are subject to the requirement unless they have taken policy action at home deemed to be of comparable stringency to U.S. action. While the impact of such measures on leveling the carbon playing field between the United States and China has been questioned (Houser et al., 2008), it is widely believed that U.S. legislation will contain some form of carbon leakage provision (also called a "China provision") aimed at appeasing labor interests, which have widely supported and helped shape the provision.

Trade measures are not the only means of addressing the competitiveness issue between the United States and China. Fashioned carefully, closer collaboration on clean energy could enhance the economic prospects of both nations while conferring on neither an unfair competitive advantage. However, recent events have illustrated ongoing tensions in both countries surrounding access to clean energy markets. For example, announcements in October 2009 that Chinese wind turbine manufacturer Shenyang Power Group was supplying 2.5-MW turbines made in China for a wind farm in west Texas raised many concerns, particularly from members of the U.S. Congress, that China was trying to compete with the United States in its own domestic market in an industry that the government had specifically been trying to promote with tax credits and other green jobs initiatives (Smith, 2009; Pasternack, 2009). The discussion over the Texas wind farm occurred close to the time that U.S. Department of Commerce Secretary Gary Locke traveled to China to ask for the removal of a 7-plus year policy requirement that wind turbines installed in China must be locally manufactured, essentially restricting any imported turbines. In a somewhat surprising turn of events, China agreed, opening up the Chinese market to U.S.-manufactured wind turbines. Then in mid-November 2009, Shenyang's parent company, A-Power Energy Generation Systems Ltd., announced that it had partnered with the U.S. Renewable Energy Group to build a wind turbine production factory in the United States (Burnham, 2009), and Chinese wind company Goldwind has announced its intentions to do the same. In fact, many Chinese wind companies have benefited greatly from cooperation with U.S. wind technology companies, including top firms Sinovel and Dongfang.

While the United States and China may argue over where to build the wind turbines, both countries stand to benefit from the best, lowest cost, wind turbine technology available, and healthy competition should encourage both countries to try to produce it. Clearly there is a long way to go to build the trust that will be crucial to scaling up clean energy cooperation between the United States and China that the world needs.

THE MULTILATERAL CHALLENGE

The climate change challenge is of course much bigger than just the United States and China, but these two countries are instrumental players in the ongoing international negotiations to reach a global climate change agreement. The relationship between the United States and

China, however, does not get any simpler when they are moved into a room containing 190 other countries with a vast range of alliances and interests. The U.S.-China relationship was only a minor sideshow in the international climate negotiations of the past 8 years, primarily due to minimal engagement by the United States in these talks. This has changed now that President Obama has launched a new era of U.S. climate engagement, bringing an increased focus on the country that had been singled out time and again by the U.S. Congress in the aftermath of the Kyoto Protocol—China.

The Kyoto Legacy

One of the lessons that came out of the negotiations over the Kyoto Protocol was that the executive branch, which represents the United States in the international negotiations, cannot get out too far ahead of the legislative branch of government. President Obama must balance his reluctance to put forth a target that has not been backed by U.S. legislation with pressure from the international community for U.S. leadership on climate change. The other crucial lesson of Kyoto was that Congress wants to see action by developing countries. As stated in the "Byrd-Hagel" resolution, "the exemption for Developing Country Parties is inconsistent with the need for global action on climate change and is environmentally flawed" (S.Res. 98, 1997). While the U.S. Congress has come a long way in its understanding of both the global climate change problem and its solutions since the days of the Byrd-Hagel resolution, there is still a strong concern about the United States taking on commitments to reduce greenhouse gases in the absence of similar commitments from the large developing countries. Most of the other "Annex I" countries share this concern (UNFCCC, 2009a).[4]

A key obstacle to developing country engagement in the international climate change negotiations is the "firewall" that has been placed between developed and developing countries. Institutionalized in the Kyoto Protocol, this firewall emerged in the context of the negotiations initiated by the 1995 Berlin Mandate. The Berlin Mandate allowed the international climate regime to advance by focusing only on developed country emissions, leaving developing country emissions not only off the table, but also by many interpretations, fully excluded from future discussion (UNFCCC, 1995; Bodansky, 2009).[5] But while the discussions leading up to the Kyoto Protocol were primarily focused on reaching agreement between the European Union (EU) and the United States, since the adoption of the Marrakesh Accords in 2001, the central axis in the negotiations has shifted from EU-U.S. to developed-developing (Bodansky, 2009). At the center of this developed-developing axis are the United States and China.

Today, while the U.S. Congress deliberates potentially monumental energy and climate change legislation, the international community waits and watches. The developed countries that not only signed up for a Kyoto Target back in 1997, but also are making good on their promise to fulfill it, are loathe to be left alone again in the next round of negotiations without the largest developed country emitter, the United States, at their side. The EU has already put a mandatory emissions trading program in place, and has announced a unilateral commitment to further reduce its emissions to 20 percent below 1990 levels by 2020. While such actions may signal the EU's intent to act in the absence of action by the United States, this is most certainly not the desired outcome. Japan is also deeply cognizant of its post-Kyoto legacy in the form of a challenging emissions reduction target, and is less likely than Europe to act unilaterally. While most developed countries are unwilling to act without the United States, the United States in turn is unable to act without China, and as a result U.S.-China relations moved to the center of the international climate change negotiations as countries began to negotiate a post-Kyoto framework.

The Bali Reframing

In many ways, the 13th Conference of the Parties to the United Nations Framework Convention on Climate Change that took place in Bali in December 2007 marked a significant event in the history of the climate negotiations. The Bali Action Plan that was unanimously agreed to the day after the meetings were scheduled to conclude included a new call for action from the developing countries that had largely remained off the hook in previous negotiations. In addition, the Plan left a door open for the United States to re-enter the next round of a treaty with a new commitment.

While no concrete steps were agreed to in Bali, the Conference of the Parties (COP) launched a post-2012 negotiation process which for the first time allowed for the consideration of "nationally appropriate mitigation actions" (NAMAs) by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner" (UNFCCC, 2007). These words marked the first opening for discussing enhanced developing country action, and possibly commitments.

Another notable occurrence that became evident in Bali was the beginning of a break in unity among the G-77 nations. Historically, the developing world has stood united as a negotiating block. Such a block gives small countries power in numbers, while allowing large countries like China to avoid being singled out to take on mitigation actions perhaps more in line with its contribution to the problem. As some developing countries show increased willingness to take on additional mitigation actions, the pressure for others to follow suit rises. In Bali, several of the nations that are home to the world's tropical rainforests, and as a result a large portion of global forestry related greenhouse gas emissions, began coming forward with proposals to take on voluntary targets to slow deforestation rates. Several of the OECD "developing" countries including Mexico, South Korea and South Africa, also began to show openness to taking on additional actions, and since Bali their positions have evolved even further. As a result, at this stage in the negotiations it was common to see fingers pointed at China and India as the two largest developing country emitters of fossil fuel related greenhouse gas emissions that had yet to come forward with meaningful international pledges or commitments. This caused India to try to distinguish and to distance itself from China and avoid the pressures that China was beginning to face in the international arena.

Bali also allowed for the further elaboration of possible forms of mitigation actions for developing countries. Parties examined alternatives to the "Quantified Emission Limitation and Reduction Obligations" (QELRO or "QUERLOs") that had dominated the discussions in Kyoto for commitments from developed countries. Targets that would change with economic situation were discussed, including intensity-based targets—either measured as energy consumption or carbon emissions per unit of gross domestic product. Also discussed were targets that would cover only a portion of the economy, for example specific sectors like the electric power or the cement sector. Also discussed were policies and measures as a format for an international commitment, revising pre-Kyoto discussions of "Policies and Measures" (PAMs) but this time for developing rather than for developed countries. Discussions also explored how such actions could be coupled with financing, technology and capacity building as the Bali Action Plan specified, including ideas for multilateral technology funds, and for using carbon markets to credit reductions made by policy or sectoral commitments in developing countries.

Chaos in Copenhagen

As countries prepared for the climate talks in Copenhagen,[6] there were many big issues on the table, and by the 2008 negotiations in

Poznan it appeared as if there were too many to be resolved by December 2009. Countries that had targets under the Kyoto Protocol were to commit to a new round for the post-2012 period. The role that emerging economies would play had to be defined, along with the role of the now multi-billion dollar carbon offset regime, the Clean Development Mechanism (CDM), and deforestation.[7] And then there was the issue of how the United States, unlikely to ratify the Kyoto Protocol, would rejoin the new treaty.[8]

A full six and a half weeks of negotiations were held between March and November of 2009 to help countries prepare for Copenhagen, but the discussions moved slowly even with the looming deadline. As many negotiators realized that finalizing a new legally binding international treaty in Copenhagen was highly unlikely, political leaders began to lower expectations, calling instead for a political agreement (Todd, 2009). The negotiations were able to produce a political agreement now known as the Copenhagen Accord. Expectations of many observers around the world remained higher than political reality was prepared to deliver, however, leading to widespread disappointment following the conclusion of the meeting (Vidal et al, 2009; "Copenhagen Accord is branded," 2009).

While the role that the United States and China would play in the Copenhagen talks was expected to be important for the reasons discussed above, few realized how pivotal the negotiations between the two countries would be. By the close of the first week of negotiations, many remaining fundamental disagreements between the United States and China were coming to light. The two emerging make-or-break issues for the United States and China were funding commitments of developed countries to support mitigation and adaptation efforts in developing countries, and transparency surrounding the reporting of emissions.

The issue of financing began to heat up on the third day of the negotiations when Todd Stern, the U.S. Special Envoy on Climate Change, commented that he did not "envision public funds, certainly not from the United States, going to China," launching a bevy of media headlines such as "Envoy Says U.S. Won't Pay China to Cut Emissions," "U.S. Rules Out Climate Aid to China," and even "Summit Is Seen as U.S. Versus China" (Torello, 2009; Ward & Harvey, 2009; Ball, 2009). This comment elicited a response from China's lead negotiator, He Yafei, who alluded to Stern's lack of common sense and irresponsibility (Bom, 2009), inciting even more theatrical headlines such as: "China lashes out at U.S. Climate Conference," "China 'shocked' by U.S. climate stance," and "A China-U.S. Smackdown at Copenhagen?" (Winter, 2009; Harvey & Chaffin, 2009; Corn, 2009).

The *Financial Times* reported that in a follow-up interview with He, that China "had abandoned its demand for funding from the developed world to combat climate change," calling it "the first apparent concession by a major player at the Copenhagen talks" (Harvey, 2009). This report was not, however, supported by further clarifications made by He in response to the article, where he emphasized that China understands and values the special concerns of the least developed countries (LDCs), small island nations, and African countries and supports the priority access of these countries to climate funds from developed countries. He also said that while China has been willing to take action on climate change based on its own resources, it would do a better job if it had international support ("Chinese side concedes assistance," 2009). It should be noted that throughout this exchange, no substantial money was put on the table by the United States, so the posturing was purely hypothetical.

The conversation at Copenhagen shifted from the hypothetical to the tangible by the middle of the second week of negotiations. The funding conversation had abated just as discussions over the measurement, reporting

and verification (MRV) of emissions pledges was heating up. The issue at hand was how developing country emissions mitigation actions taken domestically would be reported to the international community, and subsequently be subject to some form of international verification. Currently, developing countries only report their greenhouse gas emissions trends if they decide they have the resources to do so, which for many countries—including China—has led to highly infrequent, outdated emissions inventories.9 On Wednesday of the second week, Senator John Kerry gave a public speech explaining that the ability to verify that China, India and other countries achieve promised emission cuts is key to passing climate legislation in the U.S. Senate. Then the following day, Secretary of State Clinton joined the talks by announcing that the United States was prepared to work with other countries to jointly mobilize "$100 billion a year by 2020 to address the climate change needs of developing countries…in the context of a strong accord in which all major economies stand behind meaningful mitigation actions and provide full transparency as to their implementation" (Clinton, 2009).

Clinton's announcement in many ways was the final card that the United States had to play to remove the pressure it faced to deliver its part of a climate change agreement. It had now delivered both a target and funding (or at least the promise of both), shifting attention back towards China just as the heads of state were arriving in Copenhagen. Leaders who had arrived early worked on difficult negotiations that in the past were reserved for lower-level bureaucrats. During President Obama's day in Copenhagen he met several times with a group of about 20 countries comprised mainly of world leaders, but Premier Wen did not attend.[10] After this widely reported diplomatic snub from China, and when things did not seem to be progressing, President Obama reportedly tracked down Premier Wen, who was with leaders from Brazil, South Africa, and India, and joined their meeting. It was among these five countries that the deal was struck, which was then brought back to the larger group, and is now known as the Copenhagen Accord.

By the end of the Copenhagen negotiations it was clear that several things had changed since it had begun. First, not only had the developed-developing country divide begun to blur with the introduction of an accord that pledged emissions targets from members of both groups, but the developing countries of the "G-77," who up until the 11th hour had made great efforts to present a unified front before the larger developed countries, had clearly fractured in their positioning when it came to their support of the Accord.11 Second, China's role—not just in the climate negotiations, but also perhaps in the world—had shifted. While China may no longer wield the power it once did now that the G-77—which used to both side with and shield China—is fracturing,12 there was no question of China's power in the final hours of the negotiations when world leaders, including the President of the United States, struggled to get the ear of the Chinese negotiators (Lynas, 2009).13 Third, the ability of the UN climate negotiations to deliver a viable international climate treaty has been called into question. The fact that the 190-plus countries could not reach consensus on what is arguably the most significant international climate change deal to ever emerge from the UN process raises serious

The international negotiations are full of political posturing and colorful displays of diplomatic rhetoric camouflaging fundamental disagreements on the state of the world.

questions about the viability of the UN as a forum for developing the next stage in what eventually must become a legally binding, functional and effective international climate change agreement.

RECONCILING NATIONAL PERSPECTIVES ON MULTILATERAL AND BILATERAL ENGAGEMENT

Multilateral Perspectives

China is increasingly becoming a world power, and with that title comes a new era of global responsibility. A long proponent of multilateralism, China has been increasing its engagement and its seniority in various multilateral forums, including the United Nations. China has frequently called for a global climate solution to be reached under the UN umbrella, rather than in a smaller forum. Despite its elevated status and the important role it plays as a regional leader within Asia, China's reluctance to be a global leader has been reflected in climate negotiations.

The United States has played the role of a global leader in many forums for decades; however, in recent years it has been more hesitant to engage multilaterally, preferring instead smaller forums like the G8 or the G20. The United States has convened a smaller group of countries for climate talks in its Major Economies Forum[14] to supplement the United Nations discussions. Meetings of smaller groups of key countries can be a more effective way of working through challenging climate issues than trying to find agreement across the hundreds of UN member countries. In the UN process, however, many countries look to the United States for international leadership. A truly global climate solution will require a restructuring of entire economies and energy systems, and few if any countries will be willing to embark on this difficult journey if the United States does not seem willing to lead the way.

U.S.-China relations on climate change had been quite strong going into Copenhagen, bolstered by the series of high-level bilateral meetings in November 2009 that had led to the signing of multiple agreements. It was not a coincidence that the signing of these bilateral agreements occurred just days before the start of the Copenhagen talks. In Copenhagen, however, remaining points of disagreement on both sides came to light during the meetings, and U.S. and Chinese negotiators found themselves increasingly in contention.[15] In the end, several topics on which the United States and China could not agree threatened the viability of an international agreement, including the measurement, reporting and verification (MRV) of national mitigation actions and agreement on a long-term global mitigation target.

While some disagreements, such as over a long-term emissions reduction target,[16] were anticipated, U.S. negotiators were surprised by contention over issues they believed had been resolved in the bilateral discussions of the previous year. Much progress had been made on the "MRV" issue in, for example, the discussions that led to the signing of the Memorandum of Cooperation to Build Capacity to Address Climate Change between the U.S. EPA and China's NDRC. The MRV issue is sensitive for China, not only because of its longtime concerns about data quality (Lee, 2009) that have resulted in embarrassing confrontations,[17] but also because of the precedent that international verification sets for the negotiations going forward. While it was important to U.S. negotiators that China agreed to the international verification of its emissions pledges so that they could report back to Congress that China was now internationally accountable for its mitigation actions, they also wanted to eliminate as much differentiation as possible between the verification procedures applied to developed and developing countries. While it can be argued that China got much of what it seemed to want from the Copenhagen

deal (Wong, 2009), China was not completely satisfied with the result of the meeting, particularly with the concessions it made on the topic of MRV.

There are several reasons why China's stance in this round of multilateral negotiations did not always reflect its position in the recent bilateral discussions with the United States. The international negotiations are full of political posturing and colorful displays of diplomatic rhetoric camouflaging fundamental disagreements on the state of the world. Another factor, however, was perhaps the remaining skepticism in China about the willingness of the United States to take strong actions to transition to a low carbon economy, given the lack of concrete actions in this direction. As a result, China was unwilling to concede too much when, from their perspective, so little action was on the table. In addition, while the Obama administration had made up for a lot of lost time with China on climate change relations, it had only been at it for a year. The Chinese leadership is no doubt still trying to figure out the Obama administration, and despite the numerous trips made by U.S. officials to Beijing this past year, few of the officials making those trips had strong relationships in China to build upon.

China, for many reasons, plays a very different role in the multilateral context than it does in a bilateral one. In a bilateral discussion with the United States, China wants to be seen as an equal, and as the global superpower that it has become. In the multilateral climate negotiations, however, China time and again has served in the role of spokesperson for the developing world. The relationship between China and the G-77 is a complex but symbiotic one. At the most basic level, the smaller developing countries are heard more loudly by the larger, developed countries when they speak in a common voice, and even more loudly when China is the spokesperson. China too benefits from being aligned with the many developing countries that experience similar challenges of poverty alleviation and economic development, rather than being singled out as the largest emitter in the world. Moreover, the growing economic interdependence between China and many African nations and strong geopolitical alliances between China and the socialist developing nations are playing an increasingly important role in defining China's relationship with the rest of the developing world (Crowe, 2009; Erikson & Minson, 2006).

Bilateral Perspectives

The tendency of the United States to deal directly with or in small groups of countries, rather than via the UN process, has led to a discussion of a new global group being formed: the G2, consisting of the United States and China. Since the United States is seen as the leader of today, and China as the leader of tomorrow, many believe such a grouping is well suited.

President Obama has called the relationship between the United States and China "as important as any bilateral relationship in the world" (White House, 2009a). From a U.S. perspective, it could be much simpler to work out a deal on climate change with China directly, and in doing so could ensure that it is on the same page with its major global trading partner and the world's largest emitter. There are many commonalities in dealing with climate change that the United States and China face, as discussed previously, that lend to fruitful opportunities for collaboration. In addition, direct bilateral agreements eliminate some of the concerns about trust and transparency that emerge in larger groupings.

One key problem with the G2 approach, however, is China's aversion to the idea. As one Chinese scholar stated recently, a "Pax Chimericana would invite international hostility, be impossible for China to sustain politically, undermine the United Nations and contradict its government's commitment to multilateralism" (Jian, 2009; Gillespie, 2009). While the U.S.-China relationship is

symbiotic, it is asymmetrical, as China is an unevenly developed state. The G2 approach to climate change in particular conflicts with China's aversion to being singled out as a major emitter.

China is not the only country opposed to the G2 concept; many in the EU have expressed concern with being left out of such discussions, particularly as they relate to climate change, fearing that the United States and China will negotiate their own climate agreement and leave the rest of the world behind. The United States and EU are also aware that too much focus on China risks alienating other Asian states, including India. China is also a constructive participant in the ASEAN networks that have served to enhance Asian autonomy from the United States (Gillespie, 2009). The majority of the developing world is also averse to a G2 approach to climate change, recognizing that the success of an international climate regime that includes financing for mitigation and adaptation will require the active engagement of the United States and China.

While direct bilateral engagement between the United States and China cannot replace the participation of both countries in an international climate change agreement, such a partnership may be crucial to facilitating international talks. Bilateral forums provide important opportunities for the concrete demonstration of commitment through the establishment of joint projects and initiatives with tangible deliverables. They can focus on issues that are less politicized than climate change, such as clean energy, and can build bridges between government agencies and researchers outside of the diplomatic services of both countries.

Even a successful foundation of bilateral agreements between the United States and China appeared to have had little bearing on the discussions in Copenhagen—even the bilateral discussions—when 192 other countries were in the building. As a result, the discussions that President Obama held with Premier Wen in Copenhagen were far less positive than those he had a few weeks earlier with President Hu in Beijing. This reality illustrates the limits of bilateral discussions in moving the multilateral climate debate.

AN OUTLOOK FOR THE FUTURE

The conversation between the United States and China on climate change is in many ways just beginning. While bilateral activities have been in place for decades, and both countries are playing an increasingly central role in the multilateral climate negotiations, the role that both countries will play in the global climate change solution is just starting to be defined. Both countries have taken positive steps at home to promote low carbon energy sources and increase energy efficiency. Neither country, however, has adopted economy-transforming, mandatory restrictions on carbon emissions.

There clearly can be no solution to global climate change without the United States and China, and such a solution will depend on the ability of these two countries to see eye to eye. It will take them many years to build the trust needed to overcome their differences on this issue, to develop and adopt low-carbon technologies, and to transform their economies. As the entire world looks to the United States and China to make a move, the fate of the global climate system remains in their hands.

Joanna Lewis is an assistant professor of science, technology and international affairs at the Edmund A. Walsh School of Foreign Service at Georgetown University. She has been conducting research on energy and climate issues in China for ten years focusing on renewable energy industry and policy development, mechanisms for low-carbon technology transfer in the developing world, and expanding options for multilateral engagement in a post-2012 international climate change agreement.

Table 1. Timeline of US-China Clean Energy Climate Change Cooperation

Year	Name	Actors	Purpose
1979	Scientific and Technology Cooperative Agreement	Official bilateral governmental agreement established by President Carter and Vice Premier Deng Xiaoping	Began with a focus on high-energy physics and then served as an umbrella for 30 subsequent bilateral environment and energy protocols. Extended for 5 years in 1991.
1979	MOU for Bilateral Energy Agreements	U.S. DOE and the China State Development Planning Commission (SDPC)	Led to 19 cooperative agreements on energy, including fossil energy, climate change, fusion energy, energy efficiency, renewable energy, peaceful nuclear technologies, and energy information exchange.
1979	Atmosphere and Science and Technology Protocol	NOAA and Chinese Meteorological Administration	Promotes bilateral exchange on climate and oceans data, research, and joint projects.
1983	Protocol on Nuclear Physics and Magnetic Fusion	DOE and State Science and Technology Commission (SSTC)	Pursues the long-term objective to use fusion as an energy source.
1985, 2000. 2005-2010	Protocol on Cooperation in the Field of Fossil Energy Research and Development (the Fossil Energy Protocol)	DOE and Ministry of the Coal Industry (later Ministry of Science and Technology/MOST)	The first major bilateral agreement on fossil energy. Now includes 5 annexes: power systems, clean fuels, oil and gas, energy and environment technologies, and climate science. Protocol is managed by the Permanent Coordinating Group including members of both countries.
1987	Annex III to the Fossil Energy Protocol Cooperation in the Field of Atmospheric Trace Gases	DOE and Chinese Academy of Science (CAS)	Cooperative research program on the possible effects of CO_2 on climate change.

1988	Sino-American Conference on energy demand, markets and policy in Nanjing	Lawrence Berkeley National Laboratory (LBNL)/DOE and State Planning Commission (SPC)/Energy Research Institute (ERI)	Informal bilateral conference on energy efficiency that led to an exchange program between ERI and LBNL, and the first assessment of China's energy conservation published by LBNL in 1989.
1992	U.S. Joint Commission on Commerce and Trade	US Department of Commerce (DOC)	Facilitate the development of commercial relations and related economic matters between the U.S. and China. The JCCT's Environment subgroup supports technology demonstrations, training workshops, trade missions, exhibitions and conferences to foster environmental and commercial cooperation.
1993	U.S. Commercial Mission to China	DOE and DOC	For U.S. companies to promote their electric power technology services in China. Industry representatives identified a potential for $13.5 billion in U.S. electric power exports between 1994-2003 (not including nuclear power), equating to 270,000 high-salary U.S. jobs and an opportunity for introducing cost-effective, environmental sound U.S. technologies into China's electric power industry.
1993	Establishment of the Beijing Energy Efficiency Center (BECon)	ERI, LBNL, Pacific Northwest National Laboratory (PNNL), WWF, EPA, SPC, SETC, SSTC	The first nongovernmental, nonprofit organization in China focusing on promoting energy efficiency by providing advice to central and local government agencies, supporting energy efficiency business development, creating and coordinating technical training programs, and providing information to energy professionals.
1994	Annexes to the fossil energy protocol	DOE and SSTC	(1) To make positive contributions towards improving process and equipment efficiency, reduce atmospheric pollution on a global scale, advance China's Clean Coal Technologies Development Program, and promote economic and trade cooperation beneficial to both parties. (2) Cooperation in coal-fired magnetohydrodynamic (MHD) power generation.

1994	China's Agenda 21 Document Released	SSTC and China's National Climate Committee	Lays out China's request for international assistance on environmental issues. The U.S. agreed to support China through DOE's Climate Change Country Studies and Support for National Actions Plans programs.
1995	Series of DOE bilateral agreements signed by Secretary of Energy Hazel O'Leary	***Bilateral agreements on energy between DOE and ministries as noted below:*** (1) MOU on bilateral energy consultations (with SPC) (2) Research on reactor fuel (with China Atomic Energy Authority) (3) Renewable energy (with Ministry of Agriculture) (4) Energy efficiency development (with SSTC) (5) Renewable energy technology development (with SSTC) (6) Coal bed methane recovery and use (with Ministry of the Coal Industry) (7) Regional climate research (with the China Meteorological Administration) ***Also established:*** • Plan for mapping China's renewable energy resources (with SPC) • Strategies for facilitating financing of U.S. renewable energy projects in China (with SPC, Chinese and U.S. Ex-Im Banks) • Discussions for reducing and phasing out lead in gasoline in China (DOE & EPA with China's EPA & SINOPEC)	
1995 (some annexes in 1996)	Protocol for Cooperation in the Fields of Energy Efficiency and Renewable Energy Technology Development and Utilization	DOE and various ministries	This Protocol has seven annexes that address policy; rural energy (Ministry of Agriculture); large-scale wind systems (with SEPA); renewable energy business development (with SETC) and geothermal energy; energy efficiency (with SPC); and hybrid-electric vehicle development. Ten teams of Chinese and U.S. government and industry representatives work under this protocol focusing on: energy policy, information exchange and business outreach, district heating, cogeneration, buildings, motor systems, industrial process controls, lighting, amorphous core transformers, and finance.
1995-2000	Statement of Intent for Statistical information exchange (later became a Protocol)	DOE and China's National Bureau of Statistics (NBS)	Consisted of five meetings to discuss energy supply and demand and exchange information on methods of data collection and processing of energy information.
1997	U.S.-China Forum on Environment & Development	Established by Vice President Al Gore and Premier Li Peng	Venue for high-level bilateral discussion on sustainable development. Established four working groups: energy policy, commercial cooperation, science for sustainable development, and environmental policy. Three priority areas for cooperative work: urban air quality; rural electrification; and clean energy and energy efficiency.

1998-ongoing	Agreement of Intent on Cooperation Concerning Peaceful Uses of Nuclear Technology	DOE and SPC	Paved the way for the exchange of information and personnel, training and participation in research and development in the field of nuclear and nuclear nonproliferation technologies.
1997	Energy and Environment Cooperation Initiative (EECI)	DOE and SPC	Targeted urban air quality, rural electrification and energy sources, and clean energy sources and energy efficiency. Involved multiple agencies and participants from business sectors, and linked energy development and environmental protection.
1997	U.S.-China Energy and Environmental Center	Tsinghua University and Tulane University, with DOE and SSTC/MOST	An initiative centered at Tsinghua and Tulane Universities co-funded by DOE and MOST to: (1) provide training programs in environmental policies, legislation and technology; (2) develop markets for U.S. clean coal technologies; and (3) help minimize the local, regional and global environmental impact of China's energy consumption.
1998	Joint Statement on Military Environmental Protection	U.S. Secretary of Defense and Vice-Chairman of Chinese Central Military Commission	MOU provides for the exchange of visits by high-level defense officials and the opening of a dialogue on how to address common environmental problems.
1999	U.S.-China Forum on Environment & Development	The U.S. Ex-Im Bank, DOE, the China Development Bank, and the SDPC	The second meeting of the Forum in Washington, co-chaired by Vice President Al Gore and Premier Zhu Rongji. Two key agreements that came out of the meeting related to renewable energy included a MOU for the establishment of a $100 Million Clean Energy Program to accelerate the deployment of clean U.S. technologies to China in the area of energy efficiency, renewable energy, and pollution reduction, and a Statement of Intent on Cleaner Air and Cleaner Energy Technology Cooperation that focused on energy efficiency improvements in industrial coal-fired boilers; clean coal technology; high-efficiency electric motors; and grid-connected wind electric power.
1999-2000	Fusion Program of Cooperation	DOE and CAS	Plasma physics, fusion technology, advanced design studies and materials research.
2002-2003	U.S.-China Fusion Bilateral Program	DOE and CAS	Plasma physics, fusion technology and power plant studies.
2003	FutureGEN	DOE with many international partners	Initially a planned as a demonstration project for an Integrated Gasification Combined Cycle (IGCC) Coal plant with carbon capture and sequestration (CCS), the project was significantly restructured in January 2008 and now may provide federal funding to support CCS on a privately funded IGCC or PC plant , though the timeframe is highly uncertain.

2004	U.S.-China Energy Policy Dialogue	DOE and NDRC	Resumed the former Energy Policy Consultations under the 1995 DOE-SPC MOU. Led to a MOU between DOE and NDRC on Industrial Energy Efficiency Cooperation and includes energy audits of up to 12 of China's most energy-intensive enterprises, as well as training and site visits in the U.S. to train auditors.
2004	U.S.-China Green Olympic Cooperation Working Group	DOE, Beijing Government	Included opportunities for DOE to assist China with physical protection of nuclear and radiological materials and facilities for the Beijing Olympics as done in Athens.
2006	Asia-Pacific Partnership on Clean	U.S., China + India, Japan, Korea, Australia (later Canada)	Created public-private task forces around specific sectors: Aluminum, Buildings and Appliances, Cement, Cleaner Use of Fossil Energy, Coal Mining Power Generation and Transmission, Renewable Energy and Distributed Generation, and Steel
2006	U.S.-China Strategic Economic Dialogue (SED)	U.S. Treasury Secretary Henry Paulson and Vice Premier Wu Yi. Includes DOE, EPA, NDRC, MOST	Bi-annual, cabinet level dialogue that includes an energy and environment track.
2007	MOU on Cooperation on the Development of Biofuels	USDA and NDRC	Encourages cooperation in biomass and feedstock production and sustainability; conversion technology and engineering; bio-based product development and utilization standards; and rural and agricultural development strategies.
2007	U.S.-China Bilateral Civil Nuclear Energy Cooperative Action Plan	DOE and NDRC	To compliment discussions under the Global Nuclear Energy Partnership (GNDP) towards the expansion of peaceful, proliferation-resistant nuclear energy for greenhouse gas emissions-free, sustainable electricity production. Bilateral discussions include separations technology, fuels and materials development, fast reactor technology and safeguards planning.
2007	U.S.-China Westinghouse Nuclear Reactor Agreement	DOE, State Nuclear Power Technology Corporation (SNPTC)	DOE approved the sale of four 1,100-megawatt AP-1000 nuclear power plants which use a recently improved version of existing Westinghouse pressurized water reactor technology. The contract was valued at $8 billion and included technology transfer to China. The four reactors are to be built between 2009 and 2015.

2008	Ten Year Energy & Environment Cooperation Framework (SED IV)	DOE, Treasury, State, Commerce, EPA, NDRC, State Forestry Administration, National Energy Administration (NEA), Ministry of Finance, Ministry of Environmental Protection (MEP), MOST, and MFA	Establishes five joint task forces on the five functional areas of the framework: (1) clean efficiency and secure electricity production and transmission; (2) clean water; (3) clean air; (4) clean and efficient transportation; and (5) conservation of forest and wetland ecosystems.
2009	U.S.-China Strategic & Economic Dialogue	US Department of State and Department of Treasury, China Ministry of Foreign Affairs,	In April 2009 the SED was re-branded as the Strategic and Economic Dialogue (S&ED), with the State and Treasury Departments now co-chairing the dialogue for the United States. Treasury Secretary Timothy F. Geithner and Secretary of State Hillary Rodham Clinton were joined for the first Dialogue in July 2009 by their respective Chinese Co-Chairs, State Councilor Dai Bingguo and Vice Premier Wang Qishan, to cover a range of strategic and economic issues. The S&ED was convened again in Beijing in May 2010.
2009	Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment This MOU is to be implemented via the existing Ten-Year Energy and Environment Cooperation Framework, and a newly established Climate Change Policy Dialogue, as well as new agreements forthcoming.	DOE, State and NDRC	To strengthen and coordinate respective efforts to combat global climate change, promote clean and efficient energy, protect the environment and natural resources, and support environmentally sustainable and low-carbon economic growth. Both countries resolve to pursue areas of cooperation where joint expertise, resources, research capacity and combined market size can accelerate progress towards mutual goals. These include, but are not limited to: • Energy conservation and energy efficiency • Renewable energy • Cleaner uses of coal, and carbon capture and storage • Sustainable transportation, including electric vehicles • Modernization of the electrical grid • Joint research and development of clean energy technologies • Clean air • Clean water • Natural resource conservation, e.g. protection of wetlands and nature reserves • Combating climate change and promoting low-carbon economic growth

2009	Climate Change Policy Dialogue	Representatives of the two countries' leaders (TBD)	The United States and China will work together to further promote the full, effective and sustained implementation of the United Nations Framework Convention on Climate Change. The dialogue will promote: (1) discussion and exchange of views on domestic strategies and policies for addressing climate change; (2) practical solutions for promoting the transition to low-carbon economies; (3) successful international negotiations on climate change; (4) joint research, development, deployment, and transfer, as mutually agreed, of climate-friendly technologies; (5) cooperation on specific projects; (6) adaptation to climate change; (7) capacity building and the raising of public awareness; and (8) pragmatic cooperation on climate change between cities, universities, provinces and states of the two countries.
2009	Memorandum of Cooperation to Build Capacity to Address Climate Change	EPA and NDRC	In support of the MOU to Enhance Cooperation on Climate Change, Energy and the Environment, this five-year agreement includes: (1) capacity building for developing greenhouse gas inventories; (2) education and public awareness of climate change; (3) the impacts of climate change to economic development, human health and ecological system, as well as research on corresponding countermeasures; and (4) other areas as determined by the participants.
2009	U.S.-China Joint Commission on Commerce and Trade	Co-chaired by U.S. Dept of Commerce Secretary Gary Locke, U.S. Trade Representative Ron Kirk, Chinese Vice Premier Wang Qishan, with participation from many ministries/agencies from both countries	The Commission met in October 2009 in Hangzhou, China, and reached multiple agreements in many sectors, including, in the clean energy sector for China to remove its local content requirements on wind turbines.
2009	U.S.-China Clean Energy Research Center	DOE, MOST, NEA	First announced in July 2009 during U.S. Department of Energy Secretary Steven Chu's visit to Beijing and finalized during the November 2009 Presidential Summit, the Center will facilitate joint research and development of clean energy technologies by teams of scientists and engineers from the United States and China, as well as serve as a clearinghouse to help researchers in each country. The Center will be supported by public and private funding of at least $150 million over five years, split evenly between the two countries. Initial research priorities will be building energy efficiency, clean coal including carbon capture and storage, and clean vehicles.
2009	U.S.-China Electric Vehicles Initiative	DOE, MOST, NEA	Announced during the November 2009 Presidential Summit and building on the first-ever US-China Electric Vehicle Forum in September 2009, the initiative will include joint standards development, demonstration projects in more than a dozen cities, technical roadmapping, and public education projects.

2009	U.S.-China Energy Efficiency Action Plan	DOE, MOST, NEA	Announced during the November 2009 Presidential Summit, the plan calls for the two countries to work together to improve the energy efficiency of buildings, industrial facilities, and consumer appliances. U.S. and Chinese officials will work together and with the private sector to develop energy efficient building codes and rating systems, benchmark industrial energy efficiency, train building inspectors and energy efficiency auditors for industrial facilities, harmonize test procedures and performance metrics for energy efficient consumer products, exchange best practices in energy efficient labeling systems, and convene a new U.S.-China Energy Efficiency Forum to be held annually, rotating between the two countries. The first meeting was held in China late May 2010.
2009	U.S.-China Renewable Energy Partnership	DOE, MOST, NEA	Announced during the November 2009 Presidential Summit, the Partnership calls for the two countries to develop roadmaps for widespread renewable energy deployment in both countries. The Partnership will also provide technical and analytical resources to states and regions in both countries to support renewable energy deployment and will facilitate state-to-state and region-to-region partnerships to share experience and best practices. A new Advanced Grid Working Group will bring together U.S. and Chinese policymakers, regulators, industry leaders, and civil society to develop strategies for grid modernization in both countries. A new U.S.-China Renewable Energy Forum will be held annually, rotating between the two countries. The first was held in China late May 2010.
2009	21st Century Coal	DOE, MOST, NEA	Announced during the November 2009 Presidential Summit, the two Presidents pledged to promote cooperation on cleaner uses of coal, including large-scale carbon capture and storage (CCS) demonstration projects. Through the new U.S.-China Clean Energy Research Center, the two countries are launching a program of technical cooperation to bring teams of U.S. and Chinese scientists and engineers together in developing clean coal and CCS technologies. The two governments are also actively engaging industry, academia, and civil society in advancing clean coal and CCS solutions.

2009	Shale Gas Resource Initiative	DOE, MOST, NEA	Announced during the November 2009 Presidential Summit, this shale gas initiative will use experience gained in the United States to assess China's shale gas potential, promote environmentally sustainable development of shale gas resources, conduct joint technical studies to accelerate development of shale gas resources in China, and promote shale gas investment in China through the U.S.-China Oil and Gas Industry Forum, study tours, and workshops.
2009	U.S.-China Energy Cooperation Program	A public-private partnership, including 22 companies as founding members, including Peabody Energy, Boeing, Intel and GE.	Announced during the November 2009 Presidential Summit, the U.S.-China Energy Cooperation Program (ECP) will leverage private sector resources for project development work in China across a broad array of clean energy projects on renewable energy, smart grid, clean transportation, green building, clean coal, combined heat and power, and energy efficiency.
2010	U.S.-China Strategic & Economic Dialogue	U.S. Department of State and NDRC/NEA	26 specific outcomes were produced by the second round of the S&ED under the Strategic Track alone. Key outcomes addressing energy and climate issues specifically included MOUs on nuclear safety cooperation, EcoPartnerships, and Shale Gas; a joint statement on energy security; and three clean energy forums held each year.
2010	U.S.-China Energy Efficiency Forum	NEA/NDRC, MIIT, DOE/LBNL/ORNL/ FERC, private sector participants	This first meeting of this Forum (established in the 2009 U.S.-China Energy Efficiency Action Plan) included the signing of an MOU on industrial energy efficiency between Lawrence Berkley National Laboratory, Oak Ridge National Laboratory and the University of Science and Technology, Beijing.
2010	U.S.-China Renewable Energy Forum	NEA/NDRC, DOE/ NREL/FERC, private sector participants	The first meeting of this forum that was established in the 2009 U.S.-China Renewable Energy Partnership included a significant focus on potential cooperation opportunities between U.S. and Chinese renewable energy companies. The forum was followed by technical discussions that established three working groups on renewable energy, including: (1) planning, analysis and coordination; (2) wind technology; and (3) solar technology.
2010	U.S.-China Advanced Biofuels Forum	NEA/NDRC, DOE/ NREL, private sector participants	The 8 MOUs signed under this forum focus on private sector partnerships in advanced biofuels research and deployment. Private sector partnerships include: Boeing and PetroChina jointly developing a sustainable aviation biofuels industry in China; an expanded research collaboration between Boeing Research & Technology and the Qingdao Institute of Bioenergy and Bioprocess Technology on algae-based aviation biofuel development; and an inaugural flight using biofuel derived from biomass grown and processed in China conducted by Air China, PetroChina, Boeing and Honeywell.

Sources: Asia Society & Pew Center, 2009; Price, 2008; Baldinger & Turner, 2002; DOE, 2006, 2008, 2009a, 2009b, 2009c, 2009d, 2009e, 2009f, 2009g, 2009h, 2009i, 2009j, 2010; State 2008, 2009, State, 2010; USTR, 2009; Treasury, 2008, 2009; White House Press Office, 1999, 2009a, 2009b.

REFERENCES

"Applied Materials and China New Energy Leader CECEP to Collaborate on Advancing Solar PV." (2010, May 26). *BusinessWire.* [Online]. Available: http://www.marketwatch.com/story/correcting-and-replacing-applied-materials-and-china-new-energy-leader-cecep-to-collaborate-on-advancing-solar-pv-2010-05-26.

Asia Society Center for US-China Relations and the Pew Center on Global Climate Change. (2009). *A Roadmap for US-China Cooperation on Energy and Climate Change.* New York: Asia Society.

Baldinger, Pamela & Turner, Jennifer L. (2002). *Crouching Suspicions, Hidden Potential: United States Environmental and Energy Cooperation with China*. Washington, D.C.: Woodrow Wilson International Center for Scholars.

Ball, Jeffrey. (2009, December 14). "Summit Is Seen as U.S. Versus China." *Wall Street Journal*. [Online]. Available: http://online.wsj.com/article/SB126074144005789473.html.

Bodansky, Daniel. (2009, December 21). "Preliminary thoughts on the Copenhagen Accord." The *Ethiopian Review.* [Online]. Available: http://www.ethiopianreview.com/index/17713.

"Boeing and Chinese energy officials announce sustainable biofuel initiatives." (2010, May 27). *PRNewswire-FirstCall*. [Online]. Available: http://www.prnewswire.com/news-releases/boeing-and-chinese-energy-officials-announce-sustainable-biofuel-initiatives-95007509.html.

Bom, Marianne. (2009, December 11). "Chinese official: Stern "irresponsible." Associated Press. [Online]. Available: http://en.cop15.dk/news/view+news?newsid=2942.

Burnham, Michael. (2009, November 17). "China's A-Power to build U.S. wind turbine factory. *The New York Times.* [Online]. Available: http://www.nytimes.com/gwire/2009/11/17/17greenwire-chinas-a-power-to-build-us-wind-turbine-factor-22742.html.

Carbon Dioxide Information Analysis Center (CDIAC). (2009). "Fossil fuel CO_2 emissions." Oak Ridge National Laboratory. [Online]. Available: http://cdiac.ornl.gov/trends/emis/meth_reg.html.

Chen Chao. (2010, March 10). "Shanxi leads China in saving energy," *China.org.cn*. [Online]. Available: http://www.china.org.cn/china/NPC_CPPCC_2010/2010-03/10/content_19576768.htm.

"China's energy consumption per unit of GDP down 3.46 percent in first 3 quarters." (2008, December 13). Xinhua News. [Online]. Available: http://news.xinhuanet.com/english/2008-12/13/content_10497268.htm.

"China revises 2008 growth figures of 9.6%." (2009, December 26). CCTV. [Online]. Available: http://english.cctv.com/program/chinatoday/20091226/101128.shtml.

China Sustainable Energy Program. (2009). "CSEP Renewable Energy Program." [Online]. Available: http://www.efchina.org/FProgram.do?act=list&type=Programs&subType=3.

"Chinese side concedes assistance to help the poor countries reduce emissions." (2009, December 16). *China News Net*. [Online]. Available: http://www.dzwww.com/xinwen/guoneixinwen/200912/t20091216_5258534.htm.

Clinton, Hillary Rodham. (2009, December 17). "Remarks at the United Nations Framework Convention on Climate Change." Copenhagen, Denmark. [Online]. Available: http://www.state.gov/secretary/rm/2009a/12/133734.htm.

"Copenhagen Accord is branded 'abject failure' by activists." (2009, December 19). *Deutsche Welle.* [Online]. Available: http://www.dw-world.de/dw/article/0,,5039226,00.html.

Corn, David. (2009, December 11). "A China-US smackdown at Copenhagen?" *Mother Jones.* [Online]. Available: http://motherjones.com/blue-marble/2009/12/china-us-smackdown-copenhagen.

Crowe, Darcy. (2009, December 23). "Venezuela, China sign oil deals." *Wall Street Journal*. [Online]. Available: http://online.wsj.com/article/SB126152693744102097.html.

Energy Information Administration (EIA). (2009). *International Energy Outlook*. Washington, D.C.: U.S. Department of Energy.

Erikson, Daniel P. & Minson, Adam. (2006, September 22). "Cuba and China: The new face of an old relationship. *Hemisphere.* [Online]. Available: http://www.allbusiness.com/public-administration/national-security-international/3975916-1.html.

Gillespie, Paul. (2009, June 6). "Why Chimerica alone may not ring quite true." *The Irish Times.* [Online]. Available: http://www.irishtimes.com/newspaper/opinion/2009/0606/1224248164752.html.

Government of the People's Republic of China (PRC). (2004). *Initial National Communication on Climate Change.*

Official submission to the United Nations Framework Convention on Climate Change. [Online]. Available: http://unfccc.int/resource/docs/natc/chnnc1e.pdf.

Government of the People's Republic of China (PRC). (2009a). "The National Development and Reform Commission announced in the first half of the year unit GDP energy consumption fell 3.35%." [Online]. Available: http://www.gov.cn/gzdt/2009-08/02/content_1381807.htm.

Government of the People's Republic of China (PRC). (2009b). "China State Council executive will study the decision to control greenhouse gas emissions targets." [Online]. Available: http://www.gov.cn/ldhd/2009-11/26/content_1474016.htm.

Harvey, Fiona and Chaffin, Joshua. (2009, December 11). "China 'shocked' by US climate stance." Financial Times. [Online]. Available: http://www.ft.com/cms/s/0/50ebdd2e-e66e-11de-bcbe-00144feab49a.html?nclick_check=1.

Harvey, Fiona. (2009, December 13). "China signals climate funds shift." *Financial Times.* [Online]. Available: http://www.ft.com/cms/s/0/b261d086-e81c-11de-8a02-00144feab49a.html.

Hornby, Lucy. (2010, April 28.) "China warns recovery threatens energy, emission goals." *Reuters.* [Online]. Available: http://in.reuters.com/article/idINTOE63R0AK20100428.

Houser, Trevor; Bradley, Rob; Childs, Britt; Werksman, Jacob & Heilmayr, Robert. (2008). *Leveling the Carbon Playing Field: International Competition and US Climate Policy Design*. Washington, D.C.: Peterson Institute for International Economics and World Resources Institute.

Jian Junbo. (2009, May 29.) "China says 'no thanks' to G-2." *Asia Times.* [Online]. Available: http://www.atimes.com/atimes/China/KE29Ad01.html.

Lee, John. (2009). "How China stiffed the world in Copenhagen. Why Beijing insists, "Don't look at our books!" *Foreign Policy.* [Online]. Available: http://www.foreignpolicy.com/articles/2009/12/21/how_china_stiffed_the_world_in_copenhagen.

Levine, Mark D. and Price, Lynn. (2009, December). *Assessment of China's Energy-Saving and Emission-Reduction Accomplishments and Opportunities During the 11th Five Year Plan: Findings and Recommendations.* Presentation to the ChinaFAQs Network for Climate and Energy Information Meeting, World Resources Institute, Washington, D.C.

Lieberthal, Kenneth G. and David B. Sandalow. (2009). *Overcoming Obstacles to US-China Cooperation on Climate Change.* Washington, D.C.: The Brookings Institution.

Lin Jiang; Zhou Nan; Mark Levine & David Fridley. (2007). *Taking Out One Billion Tons of CO_2: The Magic of China's 11th Five Year Plan?* Berkeley: Lawrence Berkeley National Laboratory.

Lynas, Mark. (2009, December 22.) "How do I know China wrecked the Copenhagen deal? I was in the room." *The Guardian.* [Online]. Available: http://www.guardian.co.uk/environment/2009/dec/22/copenhagen-climate-change-mark-lynas.

Natural Resources Defense Council (NRDC). (2009). "Strengthening US-China climate change and energy engagement—Recommendations for leaders and policymakers in the US and China." [Online]. Available: http://docs.nrdc.org/international/files/int_09021801a.pdf.

Netherlands Environmental Assessment Agency. (2007). "China now no. 1 in CO_2 emissions; USA in second position." [Online]. Available: http://www.pbl.nl/en/dossiers/Climatechange/moreinfo/Chinanowno1inCO_2emissionsUSAinsecondposition.html.

Pasternack, Alex. (2009). "Chinese wind farm in Texas: Green jobs fail?" Treehugger. [Online]. Available: http://www.treehugger.com/files/2009/11/chinese-wind-farm-texas-green-jobs-fail.php.

Price, Lynn & Wang Xuejun. (2007). *Constraining Energy Consumption of China's Largest Industrial Enterprises Through Top-1000 Energy-Consuming Enterprise Program.* Berkeley: Lawrence Berkeley National Laboratory.

Price, Robert S. (2008). *A Chronology of U.S.-China Energy Cooperation.* Washington, D.C.: The Atlantic Council of the United States.

Seligsohn, Deborah. (2010). "China in major push to meet 20% energy intensity target," Washington, D.C.: World Resources Institute. [Online]. Available: http://www.chinafaqs.org/blog-posts/china-major-push-meet-20-energy-intensity-target.

Senate Resolution 98. (1997). "Expressing the sense of the Senate regarding the conditions for the United States becoming a signatory to any international agreement on greenhouse gas emissions under the United Nations Framework Convention on Climate Change." 105th Congress, 1st Session.

Smith, Rebecca. (2009, October 30). "Chinese-

made turbines to fill U.S. wind farm." *Wall Street Journal*. [Online]. Available: http://online.wsj.com/article/SB125683832677216475.html.

Todd, Chuck. (2009, November 15). "Climate summit over before it begins?" MSNBC. [Online]. Available: http://firstread.msnbc.msn.com/archive/2009/11/15/2127671.aspx.

Torello, Alessandro. (2009, December 10). "Envoy says U.S. won't pay China to cut emissions." *Wall Street Journal*. [Online]. Available: http://online.wsj.com/article/SB126037451679983669.html?mod=WSJ_hpp_MIDDLETopStories#project%3DCOPENHAGEN_TIMELINE%26articleTabs%3Darticle.

"Trade sanctions emerge as tool to force China and India to curb emissions." (2007, March 21). Greenwire.

United Nations Framework Convention on Climate Change (UNFCCC). (1995). "Decision 1/CP.1 The Berlin Mandate: Review of the adequacy of Article 4, paragraph 2(a) and (b), of the Convention, including proposals related to a protocol and decisions on follow-up." Document FCCC/CP/1995/7/Add.1.

United Nations Framework Convention on Climate Change (UNFCCC). (2007). "The Bali Action Plan." [Online]. Available: http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_action.pdf.

United Nations Framework Convention on Climate Change (UNFCCC). (2009a). "Parties & Observers." [Online]. Available: http://unfccc.int/parties_and_observers/items/2704.php.

United Nations Framework Convention on Climate Change (UNFCCC). (2009b). "Non-Annex I National Communications." [Online]. Available: http://unfccc.int/national_reports/non-annex_i_natcom/items/2819.php.

The U.S.-China Clean Energy Forum. (2009). Seattle: Washington State China Relations Council. [Online]. Available: http://cleanenergyforum.net/community/resource.ashx?a=60.

U.S. Department of Energy (DOE). (2006, December 15). "U.S. and China Announce Cooperation on FutureGen and Sign Energy Efficiency Protocol at U.S.-China Strategic Economic Dialogue." [Online]. Available: http://www.energy.gov/news/4535.htm.

U.S. Department of Energy (DOE). (2008, January 30). "DOE announces restructured FutureGen approach to demonstrate carbon capture and storage technology at multiple clean coal plants." [Online]. Available: http://www.fossil.energy.gov/news/techlines/2008/08003-DOE_Announces_Restructured_FutureG.html.

U.S. Department of Energy (DOE). (2009a, July 15). "US-China clean energy research center announced." [Online]. Available: http://www.energy.gov/news2009/7640.htm.

U.S. Department of Energy (DOE). (2009b, November 17). "U.S.-China clean energy announcements." [Online]. Available: http://www.energy.gov/news2009/8292.htm.

U.S. Department of Energy (DOE). (2009c, November 17). *Fact Sheet: US-China Clean Energy Research Center.* [Online]. Available: http://www.energy.gov/news2009/documents2009/U.S.-China_Fact_Sheet_CERC.pdf.

U.S. Department of Energy (DOE). (2009d, November 17). *Fact Sheet: U.S.-China Electric Vehicles Initiative.* [Online]. Available: http://www.energy.gov/news2009/documents2009/US-China_Fact_Sheet_Electric_Vehicles.pdf.

U.S. Department of Energy (DOE). (2009e). *US-China Electric Vehicles* (EV) *Forum, Beijing, China September 28-29, 2009.* [Online]. Available: http://www.pi.energy.gov/122.htm.

U.S. Department of Energy (DOE). (2009f, November 17). *Fact Sheet: US-China Energy Efficiency Action Plan*. [Online]. Available: http://www.energy.gov/news2009/documents2009/US-China_Fact_Sheet_Efficiency_Action_Plan.pdf.

U.S. Department of Energy (DOE). (2009g, November 17). *Fact Sheet: US-China Renewable Energy Partnership.* [Online]. Available: http://www.energy.gov/news2009/documents2009/US-China_Fact_Sheet_Renewable_Energy.pdf.

U.S. Department of Energy (DOE). (2009h, November 17). *Fact Sheet: US-China Cooperation on 21st Century Coal.* [Online]. Available: http://www.energy.gov/news2009/documents2009/US-China_Fact_Sheet_Coal.pdf.

U.S. Department of Energy (DOE). (2009i, November 17). *Fact Sheet: US-China Shale Gas Resource Initiative.* [Online]. Available: http://www.energy.gov/news2009/documents2009/US-China_Fact_Sheet_Shale_Gas.pdf.

U.S. Department of Energy (DOE). (2009j, November 17). *Protocol between the Department of Energy of the Untied States of America and the Ministry of Science and Technology and the National Energy Administration of the People's Republic of China for Cooperation on a Clean Energy Research Center.* [Online]. Available: http://www.state.gov/documents/organization/135105.pdf.

U.S. Department of Energy (DOE). (2010, March 29). "Secretary Chu Announces $37.5 Million Available for Joint U.S.-Chinese Clean Energy Research." Press Release. [Online]. Available: http://energy.gov/news/8804.htm.

U.S. Department of State (State). (2008). *U.S.-China Action Plans.* Text of each plan (Clean Water Action Plan; Clean and Efficient Transportation Action Plan; Nature Reserves and Protected Areas; Energy Efficiency Action Plan; Clean, Efficient, and Secure Electricity Production and Transmission Action Plan; Clean Air Action Plan; Wetlands Cooperation). [Online]. Available: http://www.state.gov/g/oes/env/tenyearframework/index.htm.

U.S. Department of State (State). (2009, July 28). *U.S.-China Memorandum of Understanding to Enhance Cooperation on Climate Change, Energy and the Environment*. [Online]. Available: http://www.state.gov/r/pa/prs/ps/2009/july/126592.htm.

U.S. Department of State (State). (2010, May 25). *U.S.-China Joint Statement on Energy Security Cooperation*. [Online] http://www.state.gov/r/pa/prs/ps/2010/05/142179.htm.

United States Trade Representative (USTR). (2009). *U.S.-China Joint Commission on Commerce and Trade.* [Online]. Available: http://www.ustr.gov/about-us/press-office/fact-sheets/2009/october/us-china-joint-commission-commerce-and-trade.

U.S. Department of Treasury (Treasury). (2008, June 18). *Joint U.S.-China Fact Sheet: U.S.-China Ten-Year Energy and Environment Cooperation Framework*. [Online] Available: http://www.ustreas.gov/press/releases/reports/uschinased10yrfactsheet.pdf.

U.S. Department of Treasury (Treasury). (2009, July). *US-China Strategic and Economic Dialogue.* [Online]. Available: http://www.ustreas.gov/initiatives/us-china/.

Vidal, John; Stratton, Allegra & Goldenberg, Suzanne. (2009, December 19). "Low targets, goals dropped: Copenhagen ends in failure." *The Guardian*. [Online]. Available: http://www.guardian.co.uk/environment/2009/dec/18/copenhagen-deal.

Wang You-ling. (2010, May 26). "First United States Renewable Energy Industry Forum and the Sino-US Forum of Advanced Biofuels." Xinhua. [Online-in Chinese]. Available: http://finance.sina.com.cn/j/20100526/20368007637.shtml.

Ward, Andrew & Harvey, Fiona. (2009, December 9). "US rules out climate aid for China." *Financial Times.* [Online]. Available: http://www.ft.com/cms/s/0/e1b1f2e4-e4f7-11de-9a25-00144feab49a.html.

White House Press Office. (1999, April 8). "U.S.-China Forum on Environment and Development, Co-Chaired by Vice President Al Gore and Premier Zhu Rongji." [Online]. Available: http://clinton6.nara.gov/1999/04/1999-04-08-fact-sheet-on-vice-president-and-premeir-zhrongji-forum.html.

White House Press Office. (2009a, July 27). "Remarks by the President at the U.S./China Strategic and Economic Dialogue." [Online]. Available: http://www.whitehouse.gov/the_press_office/Remarks-by-the-President-at-the-US/China-Strategic-and-Economic-Dialogue/.

White House Press Office. (2009b, November 25). "President to Attend Copenhagen Climate Talks: Administration Announces U.S. Emission Target for Copenhagen." [Online]. Available: http://www.whitehouse.gov/the-press-office/president-attend-copenhagen-climate-talks.

Winter, Brian. (2009, December 12). "China lashes out at U.S. at climate conference." *USA Today.* [Online]. Available: http://www.usatoday.com/weather/climate/globalwarming/2009-12-11-china-climate-criticism_N.htm.

Wong, Julian. (2009) "How did China fare in Copenhagen? A critical analysis by someone not in the room." [Online]. Available: http://greenleapforward.com/2009/12/23/how-did-china-fare-in-copenhagen-a-critical-analysis-by-someone-not-in-the-room/.

Yang, Ailun. (2009, December 19). "China ended up as a useful scapegoat." The Guardian. [Online]. Available: http://www.guardian.co.uk/commentisfree/2009/dec/19/copenhagen-climate-summit-ailun-yang.

ENDNOTES

[1]Based on revised GDP figures for 2008 released by the National Bureau of Statistics at the end of 2009. Previously, a 4.59 percent decline in energy intensity had been reported for 2008 (Levine and Price, 2009).

[2]For more details on the restructuring of FutureGen see DOE, 2006 and DOE, 2008.

[3]The requirement for a purchase of international reserve allowances amounts to a carbon allotment associated with the amount of carbon embedded in the imported product on a per unit basis. These border adjustments specifically target greenhouse gas-intensive products including iron, steel, aluminum, cement, bulk glass, and paper.

[4]The Convention divides countries into groups according to differing commitments. Annex I Parties include the industrialized countries that were members of the OECD (Organization for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

[5]The Berlin Mandate initiated a process to enhance the commitments of Annex I countries under the UNFCCC, but explicitly states that such a process will not introduce any new commitments for Parties not included in Annex I.

[6]The Copenhagen conference was officially the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change and the 5th Meeting of the Parties to the Kyoto Protocol (COP 15, COP/MOP 5).

[7]Referred to in the UN climate negotiations as REDD – "Reducing Emissions from Deforestation and Forest Degradation in Developing Countries."

[8]Among other important topics on the table included adaptation and technology transfer.

[9]The UNFCCC states "All Parties must report on the steps they are taking or envisage to undertake to implement the Convention (Articles 4.1 and 12). In accordance with the principle of 'common but differentiated responsibilities' enshrined in the Convention, the required contents of these national communications and the timetable for their submission is different for Annex I and non-Annex I Parties. Each non-Annex I Party shall submit its initial national communication within three years of the entry into force of the Convention for that Party, or of the availability of financial resources (except for the least developed countries, who may do so at their discretion)" (UNFCCC, 2009b). China's first and only national communication was submitted in 2004 and contained an outdated national emissions inventory from 10 years earlier (PRC, 2004).

[10]According to many reports, at the first session of the "leaders' meeting," He Yafei, the Vice Minister of Foreign Affairs, represented China, and later Yu Qingtai, the Special Representative for the Climate Change Negotiations, was sent even though Premier Wen Jiabao was in the building.

[11]In the wee hours of the negotiations, it became clear that while a handful of developing countries including Sudan, Venezuela and Bolivia did not support the accord, most did, including the members of the African Union, and the Alliance of Small Island States (AOSIS). While Brazil, India, China and South Africa were quiet during the late night plenary discussion, these countries' leaders had all reportedly agreed to the accord before it was brought back to the UN plenary session, so their support was assumed.

[12]As Yang Ailun, Manager of Greenpeace China's Climate and Energy Program, put it, the "cry of the most vulnerable developing countries for China to take more responsibility" caught China by surprise and "all of a sudden, the hat of 'developing country' was no longer such a convenient fit" (Yang, 2009).

[13]In the weeks following COP 15, it was further reported that the Chinese negotiating team had been internally divided in the final hours of the talks resulting in several uncharacteristic outbursts, though there was no evidence of any officials suffering any major repercussions from these actions.

[14]Formerly called the Major Economies Meeting under the Bush administration, it was renamed the Major Economies Forum by the Obama administration.

[15]While the government officials that lead the multilateral negotiations are not always the same ones who lead the bilateral discussions, there is now a higher degree of overlap between those involved in both tracks of discussions than in the past. The more technical agencies such as MOST and DOE play a larger role in the bilateral discussions, while the State Department and NDRC lead in the climate negotiations.

[16]According to several reports, including one by Mark Lynas (2009), it was China's representative who insisted that industrialized country targets, previously agreed as an 80% cut by 2050, be taken out of the deal.

[17]For example, in 2007 when the Netherlands Environment Agency announced that its researchers had calculated that China was now the largest emitter of CO_2, China's first response was that this was not true. They later realized that it was, in fact, an accurate assessment.

金 木 水 火 土

FEATURE BOX

Choke Point: U.S.

Understanding the Tightening Conflict Between Energy and Water in the Era of Climate Change

By Keith Schneider and J. Carl Ganter

Energy industry executives, fortified by high prices for oil and natural gas, are investing tens of billions of dollars annually to develop oil-bearing sands and shales, and deep gas-bearing shales. The annual investment is far larger than what the nation is spending to make the transition to a clean energy economy. And each of the unconventional reserves produces more carbon emissions, uses more water, and damages more land than the conventional oil and gas reserves they are replacing.

This is one of the central findings correspondents from Circle of Blue uncovered in Choke Point: U.S., a four-month reporting project to better understand what is occurring in the places where rising energy demand collides with diminishing supplies of fresh water. Energy production is the second highest user of water among all industrial sectors. Other Choke Point: U.S. findings include:

Peak Oil: The year that "peak oil" occurs has certainly been extended and may turn out to be a less onerous problem than expected. The recoverable oil reserves contained in bitumen-saturated tar sands and oil shales amount to trillions of barrels and are greater than recoverable "conventional" reserves. Canada's tar sands are already the single largest source of exported oil to the United States, and production is increasing almost 10 percent a year. North Dakota is now the fourth largest oil- producing state because of reserves discovered in the Bakken Shale. Three years ago, North Dakota was barely in the top ten. In both places, producing this "unconventional" oil consumes billions of gallons of water, which is raising civic discontent and concerns about the security of freshwater supplies.

Carbon Capture: Carbon capture and storage technology, which is being tested in pilot projects around the world—particularly in China—and hailed as a potential fix to climate changing emissions, increases water consumption at conventional plants 40 to 90 percent.

In order to explore these and other examples of the under-examined water-energy nexus, Circle of Blue dispatched its multi-media reporters to the coal fields of southwest Virginia; the dry plains of South Dakota; the tar sands region of Alberta, Canada; the oil fields and solar generating deserts of southern California; and the biofuel production plants in the Midwest.

IMMINENT WATER DEFICIT

Circle of Blue's correspondents concluded that unless there are sharp changes in investment and direction, the transition to a clean energy economy will lead to severe water shortages from over extraction in the United States. With the exception of solar photovoltaics and wind, clean energy sources use more water per BTU generated than conventional fossil fuels and nuclear energy. In transportation fuels, every alternative—biodiesel, ethanol, shale oil and tar sands—boosts water consumption by at least

ROCHELLE, ILLINOIS, AUGUST 2010: The Illinois River Energy biofuels plant in Rochelle releases plumes of steam at sunrise. The ethanol plant processes over 40 million bushels of corn into 115 million gallons of fuel grade ethanol annually. The plant is one of hundreds around the country transforming corn into ethanol. It takes nearly 1,000 gallons of water to produce a gallon of ethanol from irrigated corn: four gallons from unirrigated corn.
Photo © J. Carl Ganter / Circle of Blue

two times, and as much as 6,500 times.

Choke Point: U.S. also raised important questions about the nation's ability to increase energy production by 40 percent to match the demand in 2050 without causing permanent damage to wide expanses of the nation's landscape and draining the nation's freshwater reserves.

The facts and insights gathered in Choke Point: U.S. point to the need to open a new national narrative on how the United States can quickly reconsider and realign much of its energy production policy and water management practices to avoid dire shortages of water and potential shortfalls in energy. None of the big energy producers or large water use sectors will be left untouched.

LAUNCHING OF CHOKE POINT: CHINA

In August 2010, Circle of Blue joined with the Wilson Center's China Environment Forum to begin the development of Choke Point: China, a companion to the Choke Point: U.S. study. This globally significant project will produce timely, original and credible front-line research, reporting and analysis about China's most important resource competition. That competition—within the urgent frame of climate change—pits China's immense and growing appetite for energy against the country's diminishing supplies of clean freshwater. The outcome of this project will be greater understanding in China, and around the world, about the consequences and opportunities of pursuing a new energy development strategy in an era of freshwater scarcity and climate change.

To see a discussion of Choke Point: U.S., please go to CEF's website (www.wilsoncenter.org/cef) to watch the September 22, 2010, meeting with Circle of Blue staff—J. Carl Ganter and Keith Schneider—who developed and edited the project, and Jeffrey J. Fulgham, chief sustainability officer and ecomagination leader at General Electric.

Circle of Blue is an international online news, science, design and convening organization that explores the global freshwater challenges. Articles, videos, photos and interactive info-graphics from Choke Point: U.S. can be found on Circle of Blue's website, www.circleofblue.org.

J. Carl Ganter is the director of Circle of Blue. He can be reached jcarl@circleofblue.org. Keith Schneider is Circle of Blue's senior editor. He can be reached at keith@circleofblue.org.

FEATURE BOX

Advancing Clean Energy Investments in China's Electricity and Natural Gas Sector

By Diane Derby

During his visits to Beijing and Guangzhou in late May, Jon Wellinghoff, Chair of the U.S. Federal Energy Regulatory Commission, took part in a series of workshops and meetings that discussed the regulatory and policy initiatives behind energy efficiency and renewable energy programs in the United States and China.

Amid PowerPoint presentations titled "The Federal Role in Smart Grids" and "Transmission and Integration of Renewable Energy and Systems Operations," Chairman Wellinghoff spoke about recent reforms in U.S. wholesale markets that enable demand-side resources to compete against traditional supply-side resources to meet future energy needs. He also addressed how to overcome barriers to investing in what is the cheapest, most abundant, and least environmentally harmful energy resource available: efficiency.

Chairman Wellinghoff's audience included representatives of China's State Electricity Regulatory Commission, the National Development and Reform Commission, the State Grid Electric Research Institute, the State Grid Company, the China Southern Grid Company, and the Regulatory Assistance Project (RAP), which organized his visit with support from the Energy Foundation.

THE RAP ON RAP

Although not widely recognized among general audiences, the RAP acronym is well known among utility regulators and within other governmental agencies around the globe for its quiet, behind-the-scenes work in advancing policies that encourage cost-effective clean energy investments in the electricity and natural gas sectors, with particular emphasis on efficiency.

The Vermont-based non-profit has worked extensively in the United States since 1992 and in China since 1999 to provide technical and policy assistance to government officials and nongovernmental organizations. RAP recently expanded into the European Union, where its work includes contributing to the Roadmap 2050 project, and plans to initiate work in India in 2011. As advisor to the Asian Development Bank, RAP recently helped organize a two-day clean energy forum in Manila. Aided by the support of foundations and federal grants, RAP is able to provide much of its expertise at no cost to the recipient. One of RAP's supporters is ClimateWorks Foundation, which recently designated RAP as its Best Practices Network partner in the power sector.

RAP defines its mission in terms of four goals: to promote economic efficiency; protect the environment; ensure system reliability; and allocate benefits fairly among consumers. In addition to offering customized technical advice and workshops, RAP publishes extensively, with its papers and presentations readily available for download from its website, www.raponline.org. Recent topics include smart grid, wind power, demand-side management (DSM), air quality regulation, and "Clean First"—an approach that

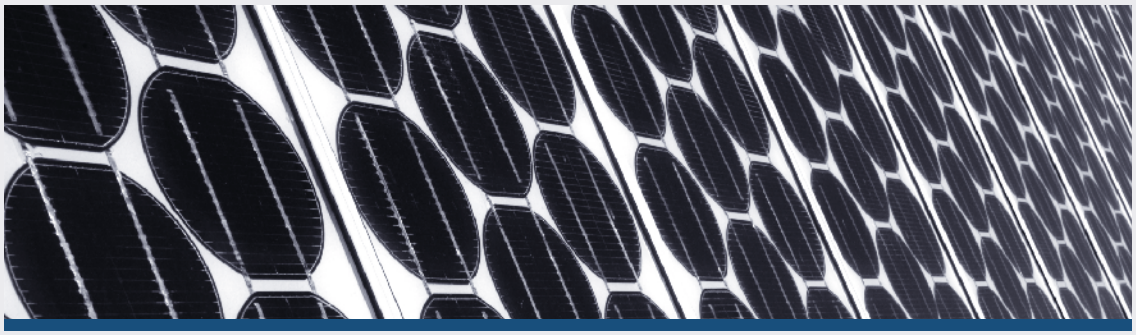
aims to better align energy and environmental interests by weighing environmental costs in power sector decision-making.

RAP'S CHINA WORK

In China, RAP is working with regulatory bodies, industry, and nongovernmental organizations on many fronts to achieve substantial reductions in greenhouse gas emissions. These include:

- Power sector regulation: RAP assisted the government in designing China's State Electricity Regulatory Commission (SERC) and is advising the commission on transmission policy, pricing, and a range of other issues. (See RAP's China's Power Sector: A Backgrounder for International Regulators and Policy Advisors)
- Renewable resources: RAP helped design and implement the 2006 Renewable Energy Law that included a 15 percent renewable energy target for total energy consumption. The law also established a grid dispatch system that gives priority to renewable resources, created a special fund for renewable energy development, and set out preferential credit and tax policies.
- Regional air quality: RAP assisted in the development of China's new Regional Air Quality Management Rule, which was issued by China's State Council on May 11, 2010. The rule identifies three regions for aggressive air quality management. (See RAP's Recommendations for China's Forthcoming Regional Air Quality Management Regulation.) RAP is also working with the Ministry of Environmental Protection and other institutions to coordinate control strategies for greenhouse gas pollution, and is supporting regulators in Chongqing in developing a climate-friendly air-quality management action plan.
- Partnership for Climate Action: RAP joined the Institute for Sustainable Communities and World Resources Institute in the U.S. Agency for International Development-supported Partnership for Climate Action, which recently launched a major public-private initiative to reduce greenhouse gas emissions and promote energy efficiency in Guangzhou and Jiangsu provinces.

Jon Wellinghoff, Chair of the U.S. Federal Energy Regulatory Commission (Third from Left) posing with Chinese counterparts at the Sino-U.S. Wind Power and Smart Grid Development Seminar in Beijing in May 2010.
Photo Credit: Regulatory Assistance Project



NEW ENERGY EFFICIENCY WORKSHOPS IN CHINA

Just days after the Wellinghoff visit, RAP helped organize a training session in Beijing for staff of provincial government agencies to help them implement DSM and energy efficiency programs. It was the first of a series of workshops that RAP will offer with the Natural Resources Defense Council and Energy Foundation, with support from the China-U.S. Energy Efficiency Alliance.

Nearly 70 people gathered in a Beijing conference center for the first session, "Planning and Constructing an Efficiency Power Plant." An efficiency power plant (EPP) is a carefully selected portfolio of energy efficiency programs that provides a specified quantity of load reduction with a level of reliability similar to the output from a conventional power plant.

The first workshop included both Chinese and international experts to share best practices from China and the United States. Participants were also introduced to the "EPP Calculator," a software tool that enables the selection of energy efficiency projects for inclusion in an EPP based on economic analysis.

The EPP Calculator shows the logical progression of economic analysis that goes from a single energy efficiency measure at a single facility, to a group of measures at a facility, to a program of measures across several facilities, and finally to an EPP portfolio. Work is currently underway for the next two training sessions.

See a full listing of RAP's publications and presentations at www.raponline.org.

Copies of the presentations from the first workshop and of the EPP Calculator software will soon be available for download at http://china.nrdc.org/library/2010DSMTraining-en (English) or http://china.nrdc.org/zh-hans/library/2010DSMTraining (Mandarin).

Diane Derby is Communications Manager for the Regulatory Assistance Project based in the Vermont office. She can be reached at: DDerby@raponline.org.

金 木 水 火 土

FEATURE BOX

Measuring and Reporting GHG Emissions in China

By Lucia Green-Weiskel

In the final days of the Copenhagen conference on climate change, efforts to reach an agreement between the 184 nations present shuttered to a halt over, among other issues, one concept represented by three letters: MRV (the Measuring, Reporting and Verification of greenhouse gas emissions). The fracture was between China and the United States—the world's first and second largest emitters, respectively. China agreed to reduce emissions in a verifiable way, as long as the verification (the V in the MRV) was executed by China, claiming that any other method would represent an unwelcome intrusion into Chinese sovereignty. The United States, citing concerns that China may submit inaccurate data, wants mitigating actions in China to be verified by international inspectors. Although many other issues loomed large, this apparent impasse was considered to mark the breakdown in negotiations in Copenhagen and was in large part the event that caused many observers to consider the negotiations a failure. However, it would be short-sighted to consider the entire event a failure based on this one hang-up. It is true that both countries shied away from making binding agreements and were criticized for failing as leaders. But top-level negotiations were not the only events happening in Copenhagen. Binding and ambitious agreements to reduce greenhouse emissions were made at the sub-national level and progress was made to set the stage for voluntary carbon reductions.

As the "world's factory," China has become a key target of climate change advocates in both the developed and developing worlds. But although China's total emissions have soared to the number one position worldwide, it rates far behind Western countries using other methods of calculation. China's per capita and historic emissions are much lower than Western countries. Additionally, nearly one-quarter of China's total annual emissions – approximately the size of Russian's total annual emissions – are directly caused by the manufacturing of products sold to export markets. When these facts are taken into consideration, it is clear that quantifying China's carbon footprint—or the carbon that China should take responsibility for – is not an easy task. Even more to the point is the example of wind and solar turbines. China is becoming a leader in the manufacturing of these products, which is undoubtedly bringing the price of these products down and increasing the world's renewable energy capacity. But the manufacturing of wind turbines and solar panels is a carbon-intensive product in and of itself. The reality is that as China contributes to the world's ability to have access to affordable alternatives to fossil fuels, its own carbon footprint is growing. All things considered, the question of who to blame for the large and growing cloud of greenhouse gases in the atmosphere over China is a complex question.

Agreement or no agreement in Copenhagen, China has set in motion plans to reduce the carbon-intensity of its economic activity. It has initiated large-scale programs to expand the capacity to generate renewable energy (solar and wind), build public transportation that is fast

and efficient (high-speed trains and subways), increase energy efficiency in every sector of the economy, and establish what could be the world's preeminent electric vehicle industry. However, in order to determine how these programs translate directly into net reductions in greenhouse gases, a mechanism must be in place to measure emissions in a reliable, transparent, consistent and verifiable way. But as China has recoiled at the idea of international inspectors, the only alternative is a voluntary MRV program. Part of the solution is to set up voluntary registries that are run internally, but reflect a methodology that is as rigorous as international standards and methodologies. The world needs reliable evidence to show that a ton of carbon in China is a ton of carbon anywhere else in the world.

In response to this concern, many NGOs are working on ways to measure, report and verify emissions on a voluntary basis. The Innovation Center for Energy and Transportation (iCET), with support from the Rockefeller Brothers Fund and the Hewlett Foundation, has developed a concrete and practical tool to do just this. iCET is working in partnership with The Climate Registry of the United States (TCR) to develop an online energy and carbon registration tool to measure and report the energy use and greenhouse gas emissions from various domestic and multinational corporations as well as local economic development areas. Through this registry, companies, provincial governments and other reporting organizations can track and meet energy efficiency targets. With this information public and standardized, enterprises can begin to do the necessary work to reduce their emissions and overall energy use.

This online registration system and related methodologies is largely adopted from the California-based Climate Registry (www.climateregistry.org). The Climate Registry grew from a small initiative in the state of California and has now expanded to become

iCET members presenting at a side event at the Copenhagen Climate talks in December 2009. Photo Credit: iCET Photo Credit: iCET

an organization that includes members from many of the North American states, provinces, territories and Native Sovereign Nations. The Climate Registry establishes GHG emission reporting standards that are credible, accurate and consistent to be used by all industries across United States. The Registry is a voluntary tool to measure carbon emissions, although eventually legislation in the United States might make carbon reduction mandatory and thereby increase the relevance of The Climate Registry's tool.

The methodology used by the European Climate Registry (ECR) is based on the GHG Protocol (www.GHGProtocol.org) developed by World Resources Institute and the World Business Council for Sustainable Development. Following their lead, the ECR protocol divides emission sources into "scopes." For example, when considering an entity's footprint, there may be:

- **Scope 1.** Direct emissions, or emissions that are within the control of the entity, defined as from stationary combustion, mobile combustion, chemical or manufacturing processes, or fugitive sources (unintentional releases).

- **Scope 2.** Indirect emissions, or emissions of which the consumption is controlled by the entity—but the generation is not—from purchases of electricity, steam, heating or cooling.
- **Scope 3.** Indirect emissions from everything else – emissions associated with the use of products that you manufacture, employees commuting to work or performing business travel.

In addition to the support from The Climate Registry, iCET has worked with Business for Social Responsibility, the California Air Resources Board, and the Chinese National Institute for Standardization. Membership in the Energy and Climate Registry includes opportunities for companies to give feedback on the reporting tool and the reporting methodology. It is becoming increasingly clear that smart tools like the Energy and Climate Registry are needed urgently in China to learn more precisely about origins of emissions. While China is the largest emitter of greenhouse gases, it is also disproportionately vulnerable to climate change, and, like all countries must take action now to mitigate the effects of climate change down the road. Guangdong province, for example, where much of the world's manufacturing is based is, on average, only 4 meters above sea level. According to a report by the Guangdong provincial weather authority, sea levels may rise by at least 30 centimeters by 2050. This means that an area of 1,153 square kilometers of Guangdong province could be submerged under water. The cities of Guangzhou, Zhuhai and Foshan – home to many of the major manufacturers of toys, electronics and other commodities – are predicted to be the worst affected. The climate expert who authored the report, Du Raodong said, "Climate change will negatively affect the economic development of Guangdong, which is currently one of the biggest consumers of energy and producers of greenhouse gasses."

The International Panel on Climate Change's (IPCC) predictions for the Pearl River Delta are even more grim. According to the IPCC's Fourth Assessment Report, sea levels could rise as much as 40-60 centimeters, flooding an area of 5,500 square kilometers in the province. Moreover, China is more vulnerable to climate change because agriculture – an industry that is highly susceptible to changes in weather – makes up a large percentage of its total economic activity. It is in China's own interest to learn more about the sources of its emissions. It is crucial that China take leadership on this issue now to protect the world – and itself – from the disasters of climate change.

ACKNOWLEDGEMENTS

The Energy and Climate Registry would not be possible without the generous support from the Rockefeller Brothers Fund and the Hewlett Foundation. We are also indebted to The Climate Registry in California and World Resources Institute for their technical support for the development of the protocol for the Energy and Climate Registry in China.

Lucia Green-Weiskel is a Project Manager at the Innovation Center for Energy and Transportation, a non-profit policy center based in Beijing, China that is dedicated to mitigating climate change through low-carbon fuels and vehicles and innovative and solution-oriented policies and tools. For more information on iCET, please see: www.iCET.org.cn. For more information on the Energy and Climate Registry, please see: www.ChinaClimateRegistry.org.